EVERYDAY HEALTH SERIES

BOOK ONE

BUILDING HEALTH HABITS

O'SHEA & KELLOGG

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Catherine Myers.

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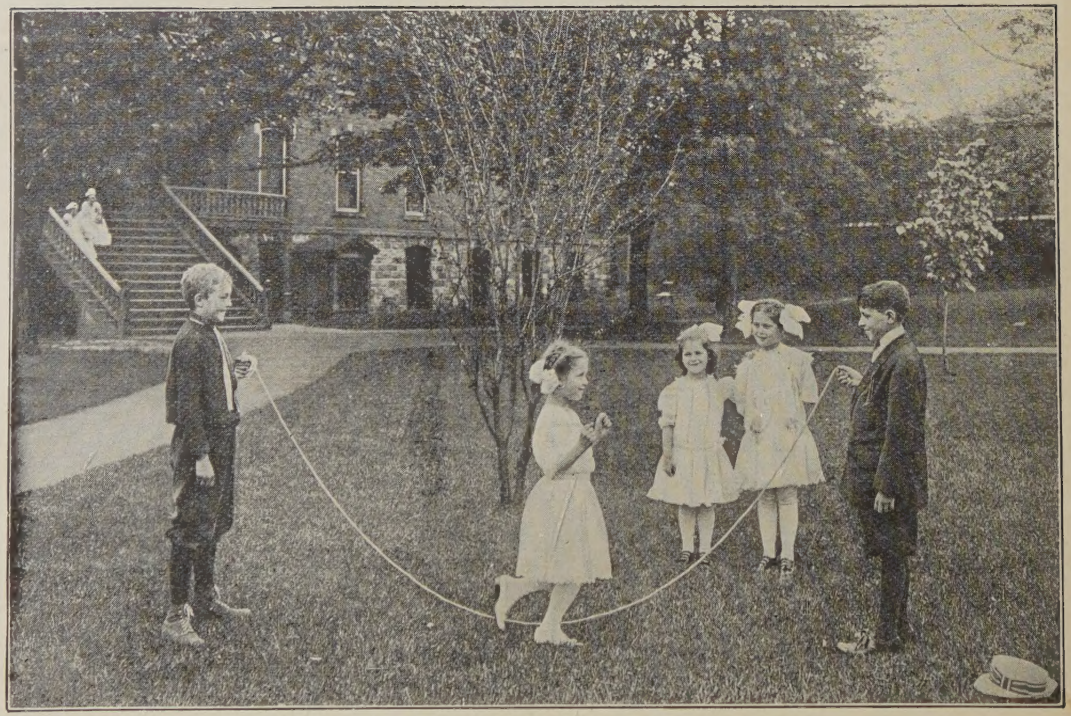

PEOPLE WHO ARE WELL GET MUCH MORE OUT OF LIFE THAN THOSE WHO ARE SICK.

THE EVERYDAY HEALTH SERIES

Book One

BUILDING HEALTH HABITS

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INTRODUCTION

TO THIS SERIES

It is the aim in The Everyday Health Series to present in an attractive form for pupils in the elementary school the latest and most accurate knowledge relating to physiology and to the hygiene of daily life. The constant effort of the authors has been to make scientific knowledge so simple, so concrete, and so inviting that pupils can hardly fail to take an interest in the problems of preserving health for the purpose of making the most of life.

The aim has been kept in view of awakening in the child a normal desire to live in such a manner as to develop strength and preserve health, because in this way he will have the greatest success in securing the things which he desires, and in avoiding the disabilities and pains which otherwise are likely to occupy a considerable part of his life. Comparatively little attention is given to anatomy, and only sufficient physiology is presented to constitute a basis for the facts of health that are discussed.

Very extensive use is made of photographs and diagrams illustrating everyday life in the city and in the country. At least one interesting and practical original exercise is suggested for every principle of health presented in each lesson. In order further to assist the teacher and the pupil, a list of questions, fully covering the text, is given at the end of each chapter.

PREFACE

TO BOOK ONE

THIS book is designed for pupils in the intermediate grades of the elementary school. The aim is to lead young pupils to see that their habits of living determine whether they will, much of the time, be sick or well and whether or not they will have strength to perform the various tasks of daily life.

In the preparation of the book, the authors have observed the typical child in everyday life. They have noted his tendencies in matters involving health, and they have studied particularly his problems in adapting himself to present-day conditions in the country and in the city. These observations have suggested the subjects pertaining to health which will interest a child and will be of practical value for him. These are the subjects that are discussed in this book.

With a view to determining the child's habits, the authors have further studied children in respect to their attitude toward different methods of presenting facts of health. They have found that the typical child is not much influenced by mere exhortation to live in a healthful way; but he is greatly influenced by everything which promises to increase his energy for his games and plays and which will help him to avoid the pains and sickness from which he frequently suffers, and which he knows deprive him of the opportunities he craves to be in action all the time and to succeed as well as his rivals in his undertakings. These traits of children have determined the manner in which the facts and principles in this book are treated.

The plan throughout has been (1) to use simple and concrete terms, (2) to develop the meaning of any new term before it is given, (3) to illustrate every principle of health by familiar examples and by photographs and drawings, and (4) to have the young become self-helpful in solving practical problems relating to health habits. In order to assist the pupil to keep in mind the points discussed, marginal headings are freely used. Lists of questions are appended to each chapter for the use of both the pupil and the teacher. The pronunciation and the meaning of hard words are indicated at the end of the book.

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BUILDING HEALTH HABITS

CHAPTER I

What Good Health Means

When a person is in good health, his whole body is in fine working order. He feels no pains, aches, lameness, or laziness. He feels full of life and vigor. When one does not have good health, the trouble is generally due to lack of proper care of the body, either on the person's own part, or on the part of some one else.

It pays to have good health

The rose gardener, who every week in the warm weather loosens the soil about his plants, waters them, weeds them, and keeps them free from insects, will have larger and more beautiful blossoms than if he simply left the roses to do the best they could without any care. His bushes will become so strong and hardy that they can endure the frost and the cold when the winter season comes around. But if they are neglected, they will soon die.

Just as with the gardener's rosebushes, so anyone who takes pains to give his body the right kind of care every day can be strong and hardy. With good health, the body is so full of life and force that it can resist disease, as the strong rose plant can resist the frost.

It pays to have good health. The person who has excellent health will not suffer with headache, toothache, earache, boils, coughs, colds, and other ills. When a boy has something the matter with him every now and then, he misses many pleasures

and falls behind in his work. Think of two persons you know, one of whom has poor health (that is, he has pains or aches of some kind, or he cannot eat or sleep well), while the other has good health. Surely you will find that the latter gets more out of life than the former. He can accomplish more with his mind and his body. He can do his work with greater ease. He can earn more money. He will probably live longer. He will be more cheerful and happy. He can therefore give more pleasure and be more useful to the people around him, and he will be more popular with them.

Good health is possible

How many of those you know have good health? I once asked eight hundred young women, students in a college,—"How many of you feel well all the time?" Only a few were found who did not have some kind of ache or pain. What do you think about the health habits of those girls?

Some persons have good health much of the time. Many of us have only a fair average. Ought not every one to aim for a 100% mark in health, as well as in other things? It is quite possible to live so as to keep one's health sound. When Mr. Roosevelt was President, he asked Professor Irving Fisher, of Yale University, to find out how many people in the United States were sick from diseases that might have been prevented. Investigation showed that there were *three million* people in the United States sick all the time, and that one half of this number (1,500,000) need not have become ill if they, or some one else, had not carelessly broken the laws of health.

Health, the valuable gift

Henry's father made him a present of a fine new bicycle. Its wheels spun around like a top. It did not rattle or creak. So long as Henry took good care of his bicycle, it looked new and fine, and was always ready to give him a good time when he rode it. By and by,

he began to neglect his bicycle. He forgot to clean and oil it. It became rusty and dirty. It rattled as it ran. Its wheels turned so hard that it was no longer any pleasure for Henry to ride it.

Our bodies are in some ways like bicycles. With good care they serve us well, and are so full of vigor that work is a pleasure and it is not hard to do our best in whatever we undertake.

"Our pony helps us to keep feeling fine."

If some one gave you a valuable gift, would you treat it carelessly and spoil it, as Henry did his bicycle? Or would you take good care of it, and keep it sound as long as possible? Do you not think everyone ought to take such care of his body that it will always be in good working condition?

Remember: It is not the weak and the sickly people who win the race, or who have the best time, or who do the most things that are worth while.

Health Problems

1. Think over what you did during the last summer vacation. Count up the number of days on which no pain or ache interfered with your work or pleasure.

2. Can you tell *why* you were in good health on those days?

3. Looking forward to next summer, would you like to have some "off" days mixed in with the others? Why not? Give all the reasons you can.

4. Look at the picture of strong children on page 3. Would you rather look like this or be more delicate looking? Why?

Review Questions

1. How does good health make one feel?
2. What will good care do for the body?
3. Will it pay any one to keep in good health? In what ways will it pay?
4. What loss does bad health cause?
5. Do most persons seem to have good health?
6. Why are so many people sick much of the time?

CHAPTER II

Health Habits

Of course, you have often watched the building of houses. Have you noticed that the foundations are usually made of many separate blocks of cement or stone well fitted together? Have you ever thought that if some of these blocks were left out in places, here and there, or were carelessly laid in, the foundation would be so weakened that the house would be in constant danger of falling down?

The foundations of health

One's habits of living are the foundation of good or poor health. Like the well-placed stones in the wall, right habits strengthen and harden the body, while wrong habits weaken it and break it down. Even a single bad habit may keep one in poor health much of the time.

Ten-year-old Bertha loved to read stories. Nearly every night she took papers and books to bed with her, and read for a long time, often for hours after everyone else in the house was asleep. Her mother, who knew nothing of this bad habit, awoke her at five o'clock each morning. Thus Bertha, who needed nine hours' sleep each night to keep her in good health, often slept no more than five hours. After a time Bertha began to grow thin, to lose her appetite, to have a pain in the back of her head, and to feel irritable and unhappy. Instead of being a help she now became a care to her mother, and an extra expense to her father. Besides, the people around her grew to dislike her because she was peevish and disagreeable.

Health habits have to do with just such everyday matters as sleeping, breathing, eating, thinking, and so on. They have to do also with the way we sit, stand, and move about; with our clothing, and our exercise, and the way we treat the skin, the hands, the teeth, the eyes, and other organs.

We form a habit by doing a thing over and over until it can be done without our having to think about it. What has been done once is done more easily the second time, and still more easily each time following. If one starts right, it is quite as easy to form a habit which will count on the side of health as to form one which will count against it.

Forming habits

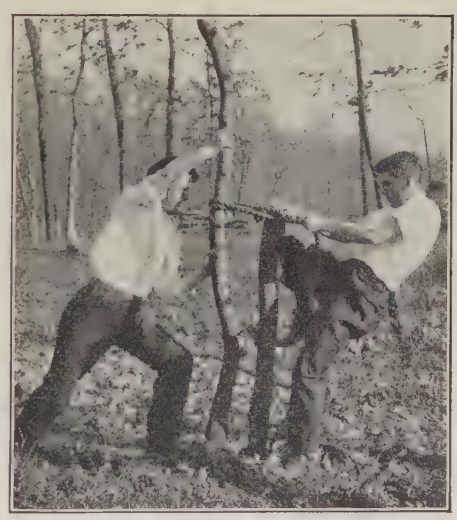
To form a habit, one must stick to an action until he does it without thinking about it. Doing the right thing one day and omitting to do it the next day is indeed a bad way to live. If a boy every now and then drops a ball of string he is winding, so much string unwinds that he may never get it wound up. So it is with forming habits that will make the body strong, hardy, and well. We must not forget health habits until we have so fixed them that they will work whether we think of them or not.

It is important, too, that we start to form good health habits while young. The earlier we begin, the stronger and more powerful the habits will become as we grow in years. If you start a stone rolling down a hill, it will be harder and harder to stop the farther it gets from the starting point. So it is with a good habit. Is it any different, do you think, with a bad habit?

Roland and Ruth lived with their parents in a beautiful country home, around which grew many fine trees. The children loved to play in the shade of these trees during the summer time. In the winter, when the leafless branches were covered with icicles or tufts of snow, they thought no fairyland was ever quite so lovely.

Being observant children, they had noticed with regret that while most of the trees were straight and graceful, two trees, a rather large one and a smaller one, were so bent that they were ugly. The children were delighted one morning when they saw some men preparing to straighten the trees. The men drove strong stakes on one side of the smaller tree in such a way that they could use the stakes to pull it up straight. After much hard work they were able to bring the tree up nearly straight, and then they braced it so that it could not fall back into its old shape. They tried the same plan with the larger tree, but although they worked over it with all their might in every way they knew how, the tree would not yield.

Correcting a habit



IT IS HARD TO CHANGE FIXED HABITS.

It is much the same with a person who has formed a good or a bad habit. When he has grown accustomed to doing anything either right or wrong, it is about as hard for him to change as it is for an old crooked tree to be straightened. At first the crooked tree was as straight as any of the others, but something bent it just a little, and every time the wind blew, it bent it a little more until it became very crooked. If when it was young an attempt had been made to straighten it, this could have been done easily.

You should notice, too, that strong, straight trees cannot be bent when they are grown. They have always kept themselves straight, and their habit of straightness is so firmly fixed that they will always remain so. "As straight as a pine" is a fine old saying.

REMEMBER: When a boy or a girl forms any habit, whether it be a good or a bad one, it is very hard ever to change it. *It is easy to change the course of a small stream, but it is not easy when the stream has become a great river.*

HEALTH PROBLEMS

1. Describe five acts you can perform without thinking about them while performing them. Why are you able to do them so easily?
2. Describe a habit of your dog or kitten that counts for its health. One that counts against its health.
3. Describe three habits in any person you know (but you need not give the person's name) that count for health. Also three habits that count against health.
4. Do you know of anyone who occasionally does something he would rather not do? Why does he do it?

REVIEW QUESTIONS

1. What are the foundations of good health?
2. Mention some matters with which health habits have to do.
3. How does one form a habit?
4. How can one keep from forming any habit?
5. When should one begin to form health habits?
6. Is it hard to break a bad habit? Why?
7. Is it as hard to change good habits as bad ones?
8. Do one's habits depend somewhat on the kind of companions one chooses? Why?

CHAPTER III

Health Habits in Standing

What do you think it is that makes such a difference in the appearance of these two boys? Notice that John stands squarely on both feet. He seems to keep his body erect without trying. He holds his head up, and his chest out. Both his shoulders are on the same level. At times, he enjoys expanding his chest as far as he can with long, deep breaths. His strong, fine carriage makes him look full of vigor, and ready for any game or any task. When I look at him, I feel sure that he is the kind of boy who will do with all his might and with pleasure

Standing habits

Which boy has the better posture?

whatever he has to do. Notice how easily and naturally he holds himself in this good position. How is he able to keep it without an effort?

Alfred stoops as he stands. His head droops forward. His back curves outward and his chest inward. One would almost think his chest was behind instead of in front of him. He walks with a careless, shambling gait. He lacks the "ready-for-business" air which John has.

If the two boys were seeking a job, which would stand the better chance of securing it? Do you think John's bearing makes him appear more *manly* than Alfred? Do you think he could play a better game, or work harder without getting tired? Why? If they should have a contest of good looks, who would win the prize? The way one holds his body has much to do with his health as well as with his appearance. Why?

Cramping the machinery

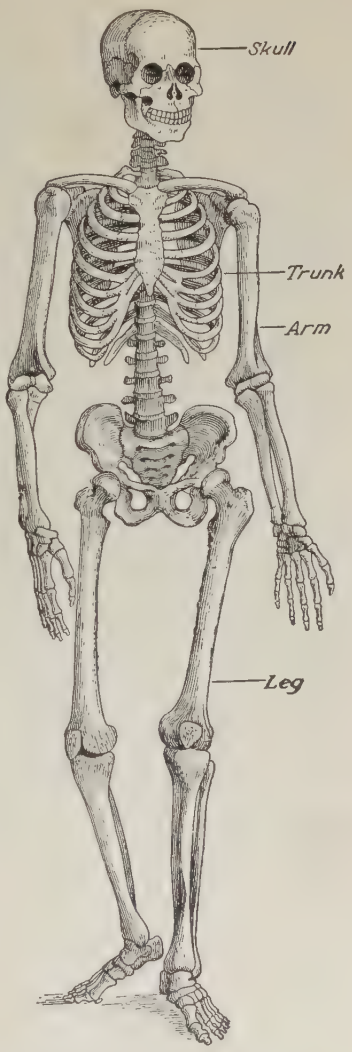
At a factory where watches are made, one may see timepieces in great variety. The case of each watch is made exactly the right size and shape to hold its working parts, or machinery. To each part is allowed just enough space for its own movement. All the parts working together move the hands around the dial. If by some accident the case of a watch should become indented or bent, it might so decrease the working space of some of the wheels that they could not turn easily, or could run only part way around. As a result, the whole machinery would be put out of order, and the watch would no longer keep good time, and would probably stop altogether.

The body resembles a watch in some ways. Within its frame are many delicate working parts with which we breathe, digest our food, and perform other acts which keep us alive and well, and enable us to play, to work, and to enjoy living. Whether the body be that of a baby or of a grown man, nature has pro-

vided it with just enough room for each of these vital parts to do its work properly when the body maintains the correct position. Then if we fall into a bad position, with stooping shoulders and a flat chest (our frame pressing in as dents in a watchcase), then these vital parts may become so crowded that it will be impossible for them to work well, and the whole body will suffer as a result.

The framework of the body

When you take hold of your arm lightly, it feels soft. But if you press upon it, you then feel something hard inside. The soft portion we call *flesh;* the hard substance within is *bone.* The framework, or *skeleton,* as it is called, by which the whole body is supported is made up of bones, together with two other kinds of materials — *cartilages* and *ligaments. Cartilage* is another name for gristle, a tough substance which you have probably seen in meat. You can feel the difference between bone and cartilage in the upper and the lower part of your nose. *Ligaments* are tough cords or bands which hold the separate



THE SKELETON

bones together. These, too, you may have found in meat. The skeleton is composed not of one, but of a great many bones, — in all, just two hundred six in number. The points at which the bones join are called *joints*.

Bow legs can be avoided. How?

The skeleton has four divisions, the skull (the bones of the head), the trunk, the arms, and the legs. The trunk forms a bony case to contain and protect some of the most important parts of the body. These parts are called *organs*, as is each other part of the body which does a special work.

The bones are the hardest parts of the body. When a person is full grown, the bones are very firm and stiff, but in the young child they consist mostly of cartilage. Cartilage is more yielding, and makes it possible for young bones to bend easily.

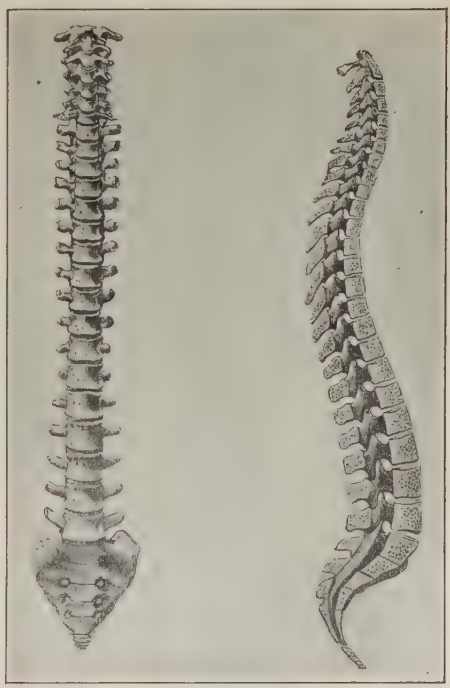
People often injure a baby by trying to make it sit alone or stand before its bones have become firm enough to support the weight of its body. Bow legs are often caused by letting a child walk while the bones in the legs are still soft.

From year to year as the child grows the cartilage hardens to bone, until when growth is complete the skeleton is mostly firm bone. If bad postures become a habit with growing

boys and girls, the bones as they harden will become misshapen and deformed. Such boys and girls may have to go through life with crooked bones. Do you know any crooked men or women, people with stooped shoulders, or with one shoulder higher than the other, with bow legs, and so on?

Habits shaping the framework

There is in the skeleton a long bony column upon which the head is carried. This is called the *spinal column* or *backbone*. It is not a single bone, but is made up of a row of separate, oddly shaped bones arranged one above the other, with cushions of cartilage between. These bones are so nicely connected that the spinal column can be made to bend with ease in any direction that the movements of the body make necessary.



FRONT AND SIDE VIEW OF THE SPINAL COLUMN, OR BACKBONE

Because it can be bent so easily, the spinal column is often made to bend when it should not, or to bend in a wrong way so often that it becomes crooked. Resting the weight in standing always on the same leg, standing with the body bent forward when at work or play, sleeping with the head raised high upon thick pillows, are ways through which

children often grow out of shape. Girls who take care of a baby often cause their backbones to become curved, because they carry the child on one arm much more than on the other. Do you use the same arm every day to carry a heavy load of books to and from school? If you do, what may be the result of this on your own spinal column? Doing so a few times will result in no injury. But when the strain from a wrong posture becomes an everyday occurrence, lasting hours at a time, or when it is often repeated for even a short time each day, then the soft young bones may yield, and deformity may result.

X-RAY VIEW OF SPINAL CURVATURE CAUSED BY BAD POSTURE

The boy or girl who wants to take the right standing poise may try this plan: Stand against a wall or a door with the heels, hips, fingers, and back of the head touching the wall. Now roll the head backward so that you can look directly up at the ceiling, letting the chest rise forward but keeping the fingers, hips, and heels hard against the wall. Draw the chin downward and inward, moving the head without changing the position of the chest and shoulders, till you look directly

To stand correctly

forward. You are now nicely balanced on the balls of the feet, and you have the poise which, with slight changes, one should keep when standing or walking.

Note how you feel when you are standing in a correct position. Observe that the chest is held well up, while the abdomen is drawn in.

CULTIVATING A SPINAL CURVATURE

If a person must stand for a long time in one place, he may put most of the weight first on one leg and then the other, thus supporting the body with one leg while the other is relaxed. He should be careful to keep a correct poise, instead of allowing the body to take a bad posture. He should make frequent changes, letting one leg relieve the other. If he has to carry heavy things, he should make each arm do its share of the work.

GETTING CORRECT POSTURE BY STANDING AGAINST THE WALL

In standing, the weight of the body should rest on the balls of the feet, and not on the heels, and with the toes turned slightly outward. The arms should hang easily at the sides, and the body should be held up straight to its full height. The shoulders should be held on the same level. The chest should be high, and the chin drawn in slightly.

No matter what you may have to do, try to keep in the *upright* attitude. If you stand on the street talking to a friend,

or if you stand for recitation in the schoolroom, try to have the feeling of being *erect*. You will soon get yourself so used to sitting and standing erect that you will establish this health habit, and then constant attention to it will be unnecessary; but you will have to give careful thought to the matter for a long time.

"I CAN STAND THIS WAY FOR A LONG TIME WITHOUT BECOMING TIRED."

One day many years ago the writer was walking along the bank of the Nile near Cairo, Egypt. Close by were two little girls playing beside the mud-walled hut in which they lived. Although they were very poor, they seemed healthy and happy. I noticed that one carried on her head a small piece of wood, the other a tin plate. Both were very anxious that the object carried should not fall off. I thought perhaps their mother required them to do this for punishment; but my guide told me she had them do it to train them to walk erect so that they might be able to carry burdens upon their heads. In many countries people often carry heavy objects upon their heads even for long distances. Such people have erect figures.

Carrying a book balanced on the head is a good way for a person to learn to stand straight and to walk erect.

REMEMBER: That if anyone wishes to have a straight, strong body, he must, while he is young, acquire the habit of carrying himself easily erect.

HEALTH PROBLEMS

1. Pick out someone of about your own age who has a very good posture when standing. Describe the way he carries his shoulders, head, chest, etc.

2. Try to see for how many seconds you can continue drawing in your breath when you are standing erect. Try this again when your chest is contracted as is shown in the picture of Alfred on page 9.

Review Questions

1. What is meant by *flesh, bone, skeleton, cartilage, ligament, joint?*
2. What are the four divisions of the skeleton?
3. What happens to the parts inside the body when one maintains a bad position?
4. If a person falls into the habit of keeping a crooked position, what happens to him by the time he is full-grown?
5. What is the *backbone* or *spinal column?*
6. How do people get crooked backbones?

Hindu girls developing erect posture by carrying objects upon their heads

CHAPTER IV

Good Posture in Sitting

If you were to make a visit to the home of some of the Fiji Island children, you would find no chairs, for when tired they rest by lying full length upon a mat or upon the ground. The

Japanese children sit erect.

Arab boy crosses his legs in front of him, and sits upon the ground, holding his body erect. It is the same way with the boys and girls in Japan, India, and many other Eastern lands. Only people of certain countries use raised seats or chairs.

When civilized people began to make furniture to sit on, they first used stools for seats. But it did not take them long to find out that their bodies became tired unless they had something to lean against. So they put a back to the stool, and it became a chair.

"I BECOME TIRED IN A SHORT TIME WHEN I SIT IN THIS CHAIR. IT IS TOO HIGH AND THE BACK IS NOT RIGHT."

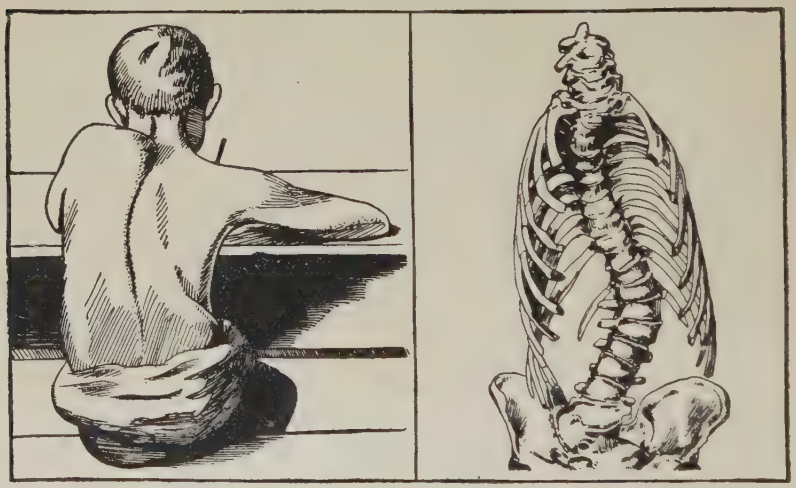
WHAT WILL HAPPEN TO THIS BOY IF HE ALWAYS SITS BENT FORWARD?

Frequently one sits in a chair so carelessly that his head droops forward, and his chest becomes flattened and so cramped that he cannot breathe deeply and fully. Consequently, he does not breathe enough air to make him feel well, and to give him liveliness and vigor. He often becomes dull. Besides, his stomach and other vital organs are forced out of place, and are hindered in their work.

What a chair may do

It is quite as necessary to hold the body in an erect position when sitting as when standing, for, as we have already seen, the organs within the trunk of the body have just the right amount

of room in which to do their work well when the body is held erect. When a person spends much of his time in a bent-over, doubled-up position, these organs are likely to get crowded out of place; they must then do their work in such cramped quarters that it cannot be well done, and their owner feels tired and distressed. Bending the body in exercise does no harm, and usually does good; but if the bent position becomes a habit, the parts which



A BAD POSTURE IN STUDYING AND THE RESULT

hold the organs in place within the trunk become so stretched and weakened that the body may be injured greatly, and serious disease may result. The bones, too, may become misshapen from the bad posture.

Many boys and girls have ugly curves in their backbones, caused by sitting at high desks with one elbow on the desk. This raises one shoulder so high that the spine becomes crooked.

If a young person sits much of the time with the body bent

forward, he will after a while become round-shouldered and flat-chested. Why?

A correct sitting position requires a seat of such a height that the feet can rest easily upon the floor, and of such a width that both hips may touch the back of the chair. A seat that is too low will cramp the legs. With a seat that is too high, the feet cannot reach the floor, and so cannot assist in supporting the body. Besides, the pressure on the nerves of the under part of the legs may cause them to become numb ("to go to sleep," as we sometimes say). Moreover, the body will slip down in the seat and bend the back. This is a bad position. Look at the pictures and you will see for yourself. Why, then, should not all chairs and seats be made to fit the height of the persons who are to use them?

The right kind of chair

IF ONE IS INCLINED TO SIT IN A STOOPING POSTURE, HE CAN SECURE THE PROPER SITTING POSTURE IN THE MANNER ILLUSTRATED IN THE PICTURE. HE SHOULD THEN ASSUME THE POSTURE SHOWN IN THE NEXT PICTURE.

To get a good sitting position, try this plan: Seat yourself with the hips touching the back of the chair. Place the hand upon the hips with the thumbs on the back as far as possible. Look toward the ceiling, carrying the head back until you are looking straight up. Press the thumbs as hard as you can upon the back, and draw down the chin. You will then have a good position. It will be worth your while to

A good sitting position

practice this occasionally. Perhaps if you ask your teacher, she will have all the pupils do this once in a while for relief and exercise.

To keep the right sitting poise, the chest must be held high. If the hips and shoulders touch the back of the chair as they ought to do, the center of the spine will of necessity curve forward. When one sits in a chair with a straight back, he will find it tiresome to keep the correct posture without using a pad or cushion fastened to the chair to support the back. It is better that the chair be made to fit the back when in proper poise.

HERE IS THE CORRECT SITTING POSTURE. NOTE HOW EASILY THE BOY KEEPS HIS SHOULDERS AGAINST THE BACK OF THE CHAIR AND HIS CHEST WELL FORWARD. IT IS SECOND NATURE WITH HIM NOW.

When one must work for several hours at a task requiring him to sit, it is important that he change his position frequently. Occasionally he should stand and move about for a few minutes to relax his muscles

Here is a bit of verse for you to learn that will help you to sit and walk correctly:

Sit with chest held well to fore,
Feet placed square upon the floor,
And do not let your body slump;
'Twill give your spine an ugly hump.
Stand head erect, with lowered chin,
Hips held back and stomach in.
Look the world straight in the face
And *walk* upright with manly grace.

REMEMBER: It will pay in good health, comfort, and efficiency to acquire the habit of sitting up straight and holding the chest high without effort.

AFTER ONE HAS BEEN SITTING FOR A WHILE, IT IS A GOOD THING TO TAKE STRETCHING AND BENDING EXERCISES

HEALTH PROBLEMS

1. Try this: While sitting, bend forward as far as you can conveniently, and see how deeply you can breathe. Then sit erect, and see if you can breathe more deeply. Explain.

2. Do the pupils in your room keep their feet squarely on the floor when they are seated? If not, why not?

3. Are there children of different heights in your home? If so, do they use chairs of different sizes?

4. Notice the positions of your classmates at their seats. Do they sit erect, or do they bend over their desks?

5. Describe the position of a person sitting badly in a rocking chair, mentioning his shoulders, his head, his chest, and so on.

Review Questions

1. What bad positions are we liable to get into when sitting, reading, or sewing?
2. Is it as necessary to have good poise in sitting as in standing? Why?
3. How is one likely to feel when he has a bad poise in sitting?
4. What is a good sitting position? What exercise will help in securing it?

CHAPTER V

Health Habits in Walking and Working

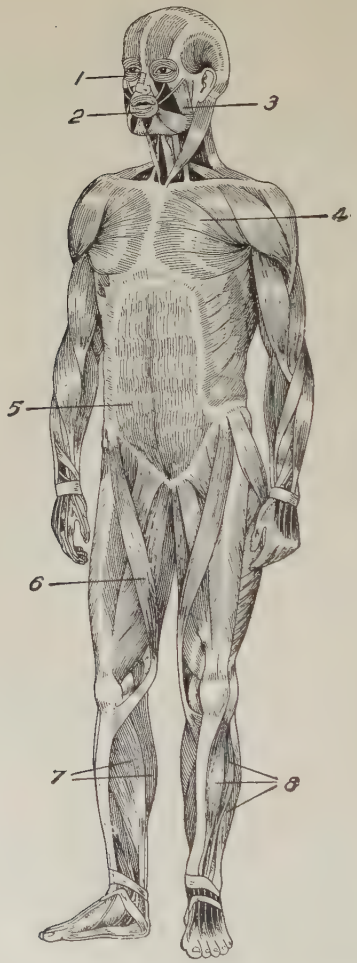
As you watch an automobile roll along the street, you know it is the machinery inside that makes it go. Have you ever wondered what it is that moves the body along when we are walking or running?

If the skin were removed from your arm so that you could see the flesh underneath, some of it would look yellowish white, and some of it red. The yellow flesh is fat, while the red flesh is *muscle*. The muscle of all animals looks alike. The lean meat of beefsteak is dead muscle. Living muscle is the machinery which moves all the parts of the body. It is by its action that we walk, run, jump, climb, throw a ball, laugh, sing, and perform all other movements of which any one of us is capable.

Muscle, the moving power

Each of us has in his body about five hundred muscles of various forms and sizes. They are arranged over the bones in such a way as to cover them and make the body plump and shapely. Most of the muscles are in pairs; that is, there are two alike, one for each side of the body.

Usually, the muscles are made fast to bones. Between the two bones to which a muscle is tied, there is a joint. One end of the muscle is attached to one bone, the other end to the other bone. Why this arrangement, do you think? But sometimes one end of a muscle is made fast to a bone, and the other end to the skin or to another muscle, as in the face. We use muscles of this kind when we smile.



1. Muscle which closes the eye; 2. Muscle which closes the mouth; 3. Muscles used in chewing; 4. Muscles used in swimming; 5. Abdominal muscles; 6. The tailor muscle; 7. Calf muscles which extend to the foot; 8. Muscles which flex the foot.

Many of the muscles are not joined to the bones directly, but are made fast to them by means of firm cords, called *tendons*. If you will place the fingers of one hand on the wrist of the other, at the same time working the fingers of the latter, you can feel these tendons moving underneath the skin.

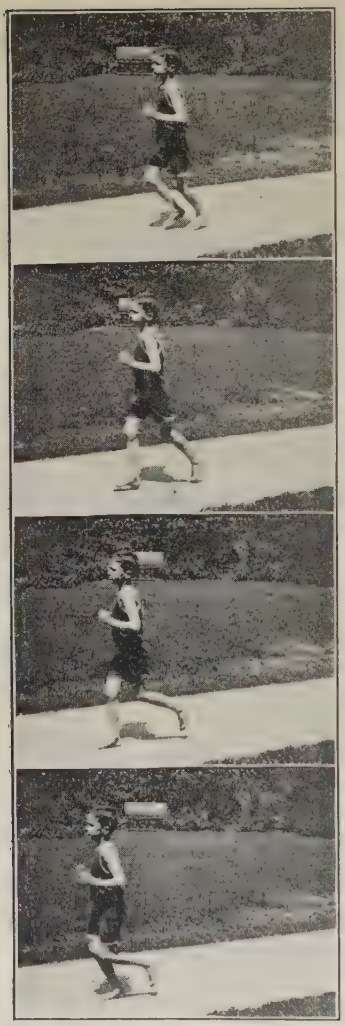
All muscles have the power to become shorter, to *contract*. With your left hand grasp your right arm just in front of the elbow. Close the right hand tightly, then open it several times. You will feel something moving. It is the working of the muscles which shorten and harden when they act, thereby causing the movement which you feel.

Each muscle is a living machine. And one curious thing about the machine is that generally the more it works the stronger it grows. It needs rest, of course. But if we would keep a muscle healthy, we must put it to use.

Use makes a muscle healthy

A SLOUCHY POSTURE IN WALKING LOOKS BAD AND IS TIRESOME.

Brisk walking makes a great many of the muscles of the body work. Walking is a splendid health habit, when one walks correctly. But one must keep an erect poise. Let the arms swing easily by the side. Many persons walk with their knees bent, but this is neither natural nor graceful. One should not walk stiffly; each step should have spring in it, as though one felt a joy in every movement. One ought to be as light on his feet as possible to avoid fatigue. When we are walking, the strides should not be too long.



IN RUNNING, BOTH FEET NEVER TOUCH THE GROUND AT ONCE AND PART OF THE TIME BOTH FEET ARE OFF THE GROUND AT THE SAME INSTANT.

One day Harold, a boy I knew, who was very careless in his walking, was slouching along with his shoulders thrown forward and his head drooping. His cousin, who owned a camera, took a snapshot of him. Later the cousin sent this to Harold. Harold could hardly believe it was himself. He made up his mind that he would correct his bad posture, but this he found was by no means an easy thing to do. The plan he liked best was to walk a mile every day carrying a tray or a basket balanced upon his head.

Running, leaping, and skipping are other modes of using the limbs in moving from one place to another. Running differs from walking in that both feet never touch the ground at once and part of the time both feet are off the ground at the same instant.

Body posture affects work and exercise

Sometimes, when boys saw wood or shovel snow, they make their backs bend too much. This cramps the organs within the trunk so that they cannot do their work well. Then the worker gets tired much more quickly than if he kept the body in

good poise and bent only at the hips. A glance at the pictures will remind you of various ways in which boys and girls, as well as men and women, often assume wrong postures. Can you call to mind other ways? If you will test the matter, you will find it is always easier for the body to do whatever you need to have it do when you keep it in a correct posture.

WRONG POSTURE IN WORKING

CORRECT POSTURE IN WORKING

REMEMBER: You can walk, run, jump, climb, or do any kind of work more easily and better if you cultivate the habit of holding the body so that none of its organs will be cramped.

HEALTH PROBLEMS

1. Count the number of muscles you can discover by feeling the different parts of your body. What must one do to find some of the smaller muscles that move the fingers, toes, jaws, and other parts?

2. Show where the muscles are that are used when you throw a ball. When you pull a rope in a tug of war. When you run. When you jump. When you chew your food. When you rise from your bed in the morning.

3. What would happen to the muscle in your right arm if you should tie up the arm for one month? Why?

Review Questions

1. What is it that moves the body when one is walking or running?
2. How many different muscles are there in the body?
3. How are the muscles arranged in the body?
4. What is the arrangement by which the muscles move the bones?
5. What is meant by *tendons?*
6. What is meant when it is said that a muscle *has the power to contract?*
7. What is necessary in order to make a muscle stronger?
8. What is the best position when carrying a pail of water? In climbing a hill or stairs?

CHAPTER VI

Health and Exercise

To keep the muscles strong so that they can do us good service we must *use* them. In other words, we must *exercise*. If you will look at the picture of the muscles on page 26, you will notice that every part of the body is covered by them. Every part of the body, then, must have exercise that it may be kept strong.

If we exercise but one part of the body, only that part becomes strong. Most persons can lift more with the right arm than with the left. How do you explain this? Why does a blacksmith have a strong right arm? Boys and girls who do not take enough exercise are likely to be pale and puny.

The self-acting muscles and exercise

Besides those muscles which make the fleshy part of the body, and which we are able to use at will, there is another kind of muscle which is *self-acting*.

Sneezing and hiccoughing are caused by muscles of this kind, and that is the reason we cannot easily stop them. The self-acting muscles act when it is necessary that they should, even though we may not wish them to do so.

All the movements of the body are made by means of muscles. The food we eat is moved along from one part of the body to another by the action of muscles, and the blood into which it is finally made is carried to all parts of the body by means of muscles. This occurs when we are asleep, as well as when we are awake, because the muscles that do the work keep on

working even when we do not think about them. The work of the self-acting muscles is wonderful indeed. We shall learn more about them later.

Exercise benefits both kinds of muscles. It makes the whole body feel fresh, and causes every part of it to tingle with new

ONE MUST BE IN GOOD CONDITION ALL THE TIME IN ORDER TO PLAY A GAME REQUIRING SELF-CONTROL AND ENDURANCE.

vigor and power. It gives one a good appetite. It gives him refreshing sleep. One can study better, and will feel better-natured and happier when he has enough of the right kind of exercise.

One may exercise muscles either in work or in play. Active play and almost all kinds of work which children have to do, such as chores about the house and garden, are good forms of exercise. Brisk walking, jumping, skipping, and climbing are good ways in which to take exercise. Swimming

How to exercise

"THIS GAME MAKES US FEEL FINE AND FIT."

is splendid exercise. Bicycle riding, when one keeps good body poise, and does not overdo it, is fine exercise; but the joy of moving rapidly over the ground on a wheel often tempts the bicyclist to ride too fast or too long. He may thus be injured instead of helped.

Exercise must be taken *daily*. We need it just as we need food and drink, *every* day. Long walks once or twice a week are good, but are not so good as regular exercise daily. Why? Suppose you should try to eat in one day all of the food needed for a week. What would be the result?

We may say there are three kinds of exercise: gentle, moderate, and violent.

Gentle exercise does not make one tired or out of breath. It is best for weak, sickly, or very old persons. Riding in a carriage or an automobile and slow walking are gentle exercises.

Moderate exercise, if kept up long, will make one tired but not out of breath. Walking at the rate of three miles an hour, light gymnastics, and nearly all kinds of ordinary work in the house, on the farm, or in the factory, are examples of moderate exercise.

Violent exercise puts one out of breath and is very tiring. This kind of exercise is overdone very easily. Moderate exercise is best as a rule. Hard running, hard rowing, fast bicycle riding, hill climbing, and most competitive games and athletic exercises are generally violent and should not be indulged in to the point of utter weariness or exhaustion.

If one begins at first with something easy, and every day does a little more, he may after a time be able to endure a great test.

There is an old story of Milo, a Greek, who one day found a little calf. He took it upon his shoulder and carried it around the ring of a great amphitheater. The next day he carried it again, and so on every day for months. The calf grew in size,

but Milo's strength also grew each day. At last he was able to shoulder the full-grown ox and to carry it as easily as he did the little calf. This he could not have done without the daily practice. How does the point here apply to your own work and play?

Violent exercises, such as running, climbing, jumping the rope, and rapid bicycle riding, should never be continued more than a few minutes at a time without an interval of rest. Moderate exercises, such as walking, simple games, swimming, and out-of-door work, are the best means of developing a strong and vigorous body.

It has been shown that smoking a single cigar usually lessens the power of a muscle to do work. Cigarette smoking or the use of tobacco in any form is harmful to some extent, at least to one who is growing and who wishes to put his muscles to the best use.

A boy who wishes to become a vigorous and healthy man will avoid all habits which compel him to take poison into his system. Life insurance experts state that the death rate of smokers is ten per cent greater than that of non-smokers.

REMEMBER: The body grows best by daily exercise in which all the muscles are tested vigorously but not so hard or so long as to injure them. With right practice, harder exercise may be taken each succeeding day.

HEALTH PROBLEMS

1. Find out as many acts as you can that are done by your body or within your body which you cannot control by trying to do so. Explain how these acts are possible, though you do not knowingly perform them.

2. Mention ten good ways in which boys and girls from nine or ten to fifteen or sixteen years of age might take exercise in your neighborhood.

Review Questions

1. Why is exercise necessary?
2. Do all parts of the body need to be exercised? Why?
3. What would happen to a baby's arms or legs if they were bound so that they could not be used?
4. What is meant by the *self-acting* muscles?
5. Do any of the muscles act while we are asleep? Mention some acts they perform.
6. What are some good forms of exercise?
7. How frequently should exercise be taken?
8. What kinds of exercise should be avoided?
9. How can one increase his strength so that he can do more work every day?
10. What habits injure the muscles?

CHAPTER VII

Play and Health

If games and sports are not played to excess, they are good for every one. Even grown-up people will be helped if they spend some time daily in play.

Play is a health habit

Active play sets the living machinery, the muscles and the vital organs, to work. It helps to make the body healthy and strong. Everybody should play, not all the time, of course, but at least part of every day. One should play just for the fun of it.

One should be reasonable in play. Do you think one should go to excess in games just for the sake of winning?

By means of training and physical exercise, the human body can be made to do remarkable feats. But it is unwise for you to attempt great "stunts" without special training under the guidance of some one who understands all about the body, and knows just how much yours can safely do. Great injury often results from overdoing in sports.

Injurious play

Boys not infrequently injure themselves by too violent exertion when they play. Violent running, if long continued, may permanently injure the heart. The writer knows a boy who became so sick as a result of running until he was completely out of breath, that he was confined to bed for several months, and was quite ill for nearly two years. Race horses and even wild animals, when pressed by hunters to violent running, sometimes fall exhausted and die in a few minutes. It does no harm to exercise hard enough to make the organs work vigorously; but

when one gets so out of breath that he feels through the chest a sense of tightness and pressure which does not quickly pass away, the heart and lungs have been overtaxed, and injury has been done.

AFTER HARD PLAY, ONE OUGHT TO HAVE A HOT AND COLD SHOWER BATH, AND THEN PUT ON DRY CLOTHING. THIS WILL KEEP ONE IN GOOD HEALTH.

The rule is, *play healthfully.* When tired, stop. If you are perspiring at the close of a game, be careful not to take cold. A good thing to do is to put on another coat or cloak, or to wrap a blanket about yourself to prevent the air from chilling the body. If no extra wrap of any sort is to be had, one should keep moving, walking at a moderate pace until the sweating ceases. Washing the hands and face in cold water will help you to feel cool. The very best thing is an all-over

Rules for play

bath with warm water followed by a cool shower. A spray, a shower, a plunge, or brisk rub with a wet towel, followed by a thorough drying of the skin with a coarse towel, are all good means of cooling off after any sort of exercise by which you have become heated.

THERE IS NOTHING BETTER FOR FUN AND HEALTH THAN SKATING.

Remember that you must use care not to get chilled before beginning the cool bath, and always while drying rub the skin until it looks red.

Such active sports as can be enjoyed in the open air are best. The outdoor air is better to breathe than the air indoors. In winter, skating, snowballing, and tobogganing afford boys and girls fine exercise in the open air. During

Outdoor sports

the warmer season hoop rolling, kite flying, and a great variety of games played with a ball, when not played to excess, furnish healthful sports.

One of the best of all sports is swimming. Every person should learn to swim. It is not only fine sport and a good way to make the body strong and to help to keep it in health, but knowing how to swim is very likely sometime to be of great service to a person in saving his own life or the lives of others. Learning to swim, like learning to walk, is a little difficult at first, but with the help of a teacher the art can soon be learned.

When running, or otherwise exercising vigorously, one easily becomes overheated, especially in hot weather; but in swimming the body is cooled by the water, and thus very vigorous exercise may be continued for a considerable time without injury.

One can swim in various positions, — upon the front, the back, or the side of the body, and can use a variety of arm and leg movements in so doing. Some ways are good for speed; others are better when one must swim a long distance. Ought one to learn and practice as many of these ways as possible? Why?

There are various forms of swimming. One of the best, often called the *breast stroke*, is one in which the swimmer lies flat upon his breast in the water. The hands are placed together in front and then spread out at the side with a backward and downward movement. At the same time the knees are drawn up and are then thrown downward when the hands are being brought forward in position for the next stroke. This is one of the easiest strokes to learn.

It is easy to learn to swim with the aid of an inflated rubber or cork belt which supports the weight of the body, thus keeping the head out of the water while the proper movements are being practiced.

The first step, of course, is to learn how to keep afloat. One cannot swim without keeping afloat, but one can float without swimming. There are several ways of learning to keep afloat, but the chief thing to do is to breathe deeply, to have no fear of the water, and to believe that it will hold you up. The body is lighter than water and will float if held in the right position. It is best to begin in water not more than waist deep. One

MANY HEALTHFUL GAMES MAY BE PLAYED IN A GYMNASIUM.

should not venture beyond his depth until he has had considerable practice, and even then it is wise to have a good boat at hand in case of need. But do not be afraid of the water if you can swim.

There are numerous playground games and sports, more than a hundred in all, many of which all boys and girls should learn and practice, not merely for pleasure, but also for the benefit that the body derives from these forms of exercise.

Gymnasium exercises

There are also various gymnasium exercises performed with swinging rings, bars, and other apparatus, which may be learned through practice, as a means of developing the muscles and training them to obey the command of the will.

Good muscle is built by good food

Many hundred years ago the boys of Greece and Rome played at games in public contests. Running, jumping, wrestling, boxing, and throwing the discus were their common sports. To gain a prize meant much practice, and trying the same thing over and over. No doubt they often tired of it, but even though they might not win the prize they gained in health and vigor of body—surely a gain of greater worth than a prize. To make their arms strong enough to box, they had to practice digging in the soil. Their training was particularly strict in regard to food. At one time nothing was allowed but bread, fresh cheese, and figs. These simple foods have in them excellent material for body building. On such fare Greek boys became so healthy and so strong that the things they could do quite surpassed what boys can do to-day. When one is growing, it is especially important to take nothing into the body but what is useful to it. To eat or drink or breathe that which is in any way harmful is most unwise.

Alcoholic drinks, opium, tea, coffee, and tobacco in every form will do one harm. They are poisons and their use checks development, hinders growth, and injures the body in other ways. How many such ways can you think of? One which perhaps does the most harm, because it is so commonly used, is the cigarette. The boys of ancient Greece and Rome did not use cigarettes; if they had, they could not have performed the feats they did in their famous games. If one smokes cigarettes, one cannot do his best at anything. A boy who smokes is like a swimmer who has a stone tied to his neck.

A young man who had been a champion tennis player began to smoke tobacco. In a short time he found that persons whom he once excelled with ease could beat him. Tobacco affects the accuracy of the eye and hand, and reduces the breathing power, so that one gets "winded" more quickly. This is why the training rules for those on college teams generally forbid the use of tobacco. You can see that by letting tobacco alone you have a good deal to gain and nothing to lose. There is really no good word that can be said for the smoking habit.

Certain drinks affect the muscles injuriously. When a man takes a drink of beer or whisky, he fancies he is stronger than he was before. But when his strength is tested, it is found that he cannot lift as heavy weights, and cannot do as hard work as he could before drinking the liquor. He cannot play any accurate game, such as golf or tennis, so well. When a man is drunk, some of his muscles will not work at all, and he seems almost like a dead man, unable often to speak or to move. Why? Because these drinks contain alcohol, which poisons the nerves and muscles. When a man is training for an athletic team, he is not allowed to drink beer, wine, or whisky.

Poisoning the muscles

REMEMBER: Plays, games, and sports are good for the mind and the body, but when they are carried to excess so that they overtax the muscles, heart, and other organs, they are bad for both the mind and the body. Alcohol and other poisons weaken the muscles.

HEALTH PROBLEMS

1. Have you ever known any one to play too hard? If so, at what game? Why did he play to excess? How could you tell that he played too hard?

2. When you play hard and for a long time, what should you do when you stop?

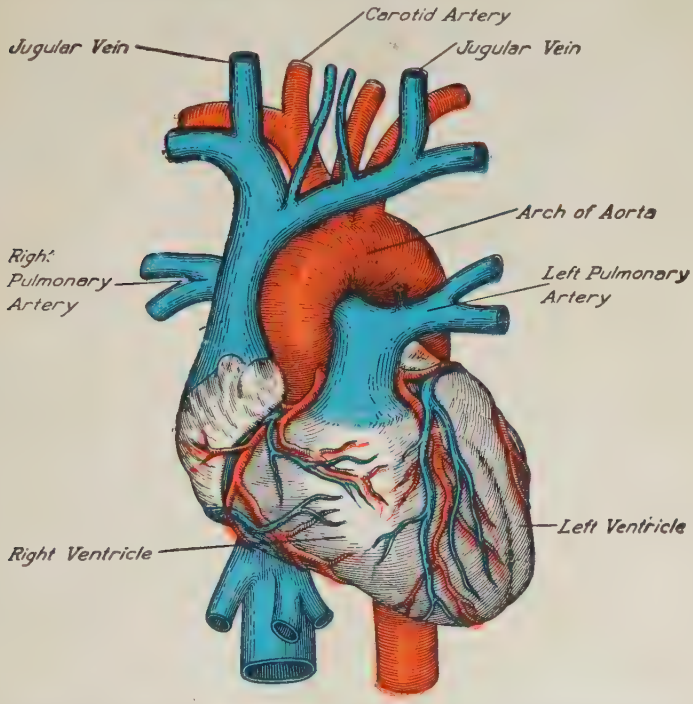
Review Questions

1. Is it natural for the young to play? Why?
2. What good may come from a fair amount of play every day?
3. What dangers should be avoided in games and sports?
4. What may happen from too hard running?
5. When should one stop in a game or sport?
6. What should be done if one is heated after a game?
7. What are good games for winter? For summer?
8. Why is swimming good exercise?
9. What dangers should be avoided in learning to swim?

CHAPTER VIII

The Heart and the Stream of Life

After you have been walking fast or running, if you place your hand on the left side of your chest, you will feel some-



As long as we live the heart sends the stream of life throughout the body.

thing beating inside. No doubt you know this is your heart. It beats all the time, although you may not always be able to

feel it. During your whole lifetime your heart never stops beating. If it should cease its work even for a minute, you would die. It does not always beat at the same rate. When you run or jump the heart beats much harder and faster than when you are sitting down or standing still. It beats most slowly as a rule when you are lying down.

The work of the heart

Place your hand over your heart, and count its beats for exactly one minute. Quite likely you will find that it beats from seventy-five to eighty times. A baby's heart works very fast, sometimes beating one hundred forty times a minute. As a person grows older, the heart beats more slowly; and in adults the average is about seventy-two beats a minute, or, when lying down, one beat every second. Excitement makes the heart beat faster; so does fright or anger. What other experiences will make it beat faster than usual?

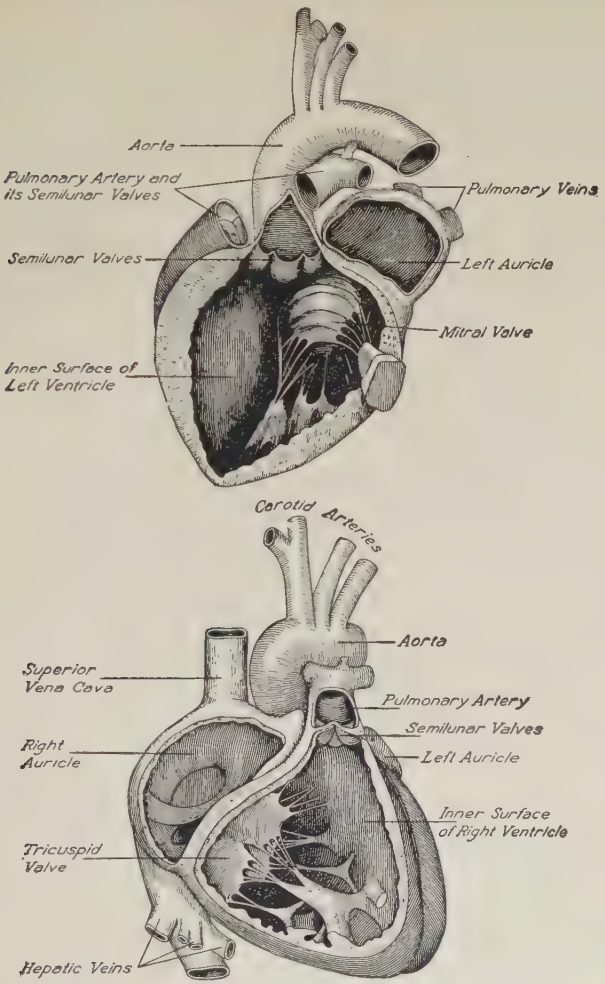
We have already learned that the body is all the time needing building material either for growth or for repairs. To provide this material we eat and drink and breathe.

But our eating and drinking and breathing would do us very little good if it were not for the wonderful living stream, the blood, which gathers and distributes to the body the necessary material, just when and where it is needed. This vital stream, besides distributing the building materials, also washes away the old and worn-out particles wherever they are found. Could any creature exist without blood? Why? The ancient prophet said "the blood is the life." Modern science says the same.

The blood and its work

But this wonderful living stream does not flow on just like a brook or a river. It flows around and around, or *circulates*, in the body. It is kept moving like the water in a fire hose, — by the action of a force pump. The beating heart is this wonderful force pump. At each stroke or beat it forces twelve ounces

of blood into the channels nature has provided for carrying the blood through the body. In one day the heart pumps blood



THERE ARE VALVES IN THE HEART. SEE IF YOU CAN TELL WHY THEY ARE NECESSARY.

equal to one hundred fifty barrels. Of course, no one has so much blood as this in his body. Only about one thirteenth of a person's whole weight is blood. How much, then, does your own blood weigh?

In its round of service the blood always starts from the heart. The course is completed by its return to the heart. The circulation is so rapid that a quantity of blood equal to all there is in the body passes through the heart every half minute.

What the heart is

The heart is a hollow muscle shaped like a pear. Each person's heart is about the size of his fist. The heart of a little baby, then, is quite tiny. A man with a big fist usually has a large heart, because his body is a large one, and it needs a good deal of blood service to keep it in working trim. The heart of a whale is as large as a washtub, while that of some small creatures can be seen only through a microscope.

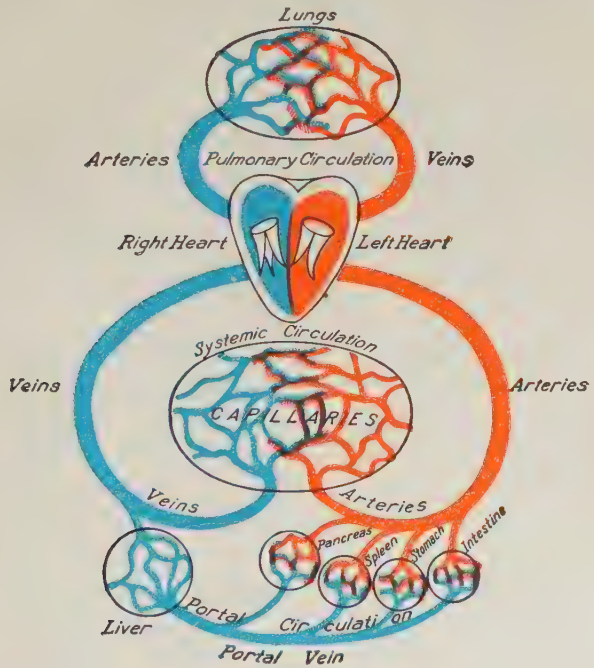
The heart is double; or rather there are two halves, separate, yet bound together, both beating at the same time, like two boys walking arm in arm and keeping step. Each part of the heart has an upper and a lower reservoir. Into the two upper reservoirs the blood that is returning to the heart is pouring all the time. From the two lower ones blood is as constantly being sent forth on its course through the body.

The circulation of the blood

The blood travels about in three different kinds of *tubes* or *blood vessels*. The vessels that take the blood from the heart are called *arteries*. Those which bring it back to the heart are the *veins*. These two sets of tubes run side by side through all parts of the body. At the ends farthest from the heart they are connected by many tiny tubes called *capillaries*. So numerous and so close are these capillaries that one cannot stick a pin through the skin anywhere without tearing many of them, and letting out blood.

My little neighbor, talking to a schoolmate just outside my open window, said, "I used to think blood was *red fluid*, just as ink is a *black fluid*." "Well, isn't it?" asked the other. "It surely looks red."

"Oh, that's because we can't see it plainly with our eyes," she replied. "The other day I looked at a drop of blood through



THE CIRCULATION OF THE BLOOD. START AT THE HEART AND TRACE THE COURSE OF AN IMAGINARY DROP OF BLOOD FROM THE TIME IT LEAVES THE HEART UNTIL IT RETURNS.

the microscope, and the liquid had no more color than water, but there were many little round, flat things floating in it. They made me think of reddish colored fish, only they looked more like tiny red plates, or disks, thinner in the middle than at the

edge. Part of the time they formed themselves into rows with their sides together, and then they looked like a roll of pennies floating along. They moved around so much I thought they were alive."

The red cells in the blood

The little girl was right. The disks she saw were *red blood cells* and they were alive. Each one of them leads as separate a life as do the fishes that swim in the water or the birds that fly in the air. There are many millions of them in a single drop of blood. It is their business to take up *oxygen* from the air in the lungs, and to carry it around the body. Each cell can carry a load of oxygen much larger than itself. These red cells give the blood its color. Yet it is only when they are laden with oxygen that they are really red. When they have given up their oxygen and are returning through the veins to the heart, they have a dark purplish color.

If my little neighbor's eyes had been keen enough, she would have seen a few larger *white cells*, perhaps somewhat different in shape. They are not so easily seen and not nearly so numerous as the red cells, — only about one white to every seven hundred red ones.

The warrior white cells

The white cells have something to do with keeping up repairs in the body. As they speed along with the blood they are on the watch, and stop just where they are needed to do any kind of repair work. And there is another thing the white cells do. When, by any chance, disease germs get into the blood, the little white cells capture and destroy them. If the white cells are healthy, and if there are enough of them, they always win in their struggles with germs. Sometimes these body defenders have to battle with such an army of germs that they are beaten, and then the germs may make a person very ill. Whenever the white cells are

so weakened that they cannot overcome the germs, the body becomes the victim of these dangerous foes of life.

The health habits about which we are learning greatly aid in keeping these watchful little bodyguards, the white cells, in condition to protect us from disease.

The fluid portion of the blood, in which the white cells and the red cells move, is made up of the water we drink and the food

THE BLOOD CELLS. NOTE THE DIFFERENT COLORS. WHY THIS DIFFERENCE?

we digest. The blood has in it, too, some special substances which, when one is in health, destroy disease germs. These substances so weaken the disease germs that the white cells can quickly overpower them.

When the body is injured, as when the flesh is cut or crushed, the blood must repair the injury. An injured part is red because it is filled with the blood which has come to repair it. You can see, then, why the blood is called the *Stream of Life*.

With all there is for the blood to do we can understand why

it serves us best when it is made out of wholesome food, pure water, fresh air, and life-giving materials. Poor food makes poor blood, which in turn does poor work for the body. Too little food brings about the same result. On the other hand, if the blood is loaded with useless materials or with poisons, every cell and tissue suffers. The brain is dull, the muscles are weak, the whole body languishes.

Importance of good blood

If we should take a drop of blood from the finger of a person who is getting too little sleep, we should find the red blood cells far too few in number. This is one reason why loss of sleep makes one look pale.

Not very long ago some very interesting experiments were made by a physician upon four young men. From the finger of each a drop of blood was drawn and carefully examined. All were found to have good, healthy blood. These young men commonly drank only pure water; but on this day they were each given two ounces of port wine. Two hours later another blood test was made. The result showed that the blood had lost some of its power to defend the body against the germs of disease. Another experiment, using two ounces of a patent medicine containing alcohol, with a test four hours after taking it, showed that the blood was injured to a still greater extent.

It has long been observed that persons in the habit of using drinks containing alcohol are usually the first to take such dread diseases as cholera and yellow fever. Another thing has been noticed; namely, that such persons do not recover from accidents and surgical operations so readily as do persons who drink only water.

If a drop of alcohol be added to a drop of blood, it will almost instantly destroy the blood cells. While ordinary alcoholic drinks, such as beer and wine, do not destroy the blood cells so quickly, still these drinks interfere with the proper work of

the blood. The body of a person who is in the habit of using strong drink is like a city whose policemen are all asleep on duty. The enemy is likely to come in without resistance. Tobacco, too, unfits the blood for doing its work.

The heart is an especially strong muscle. It has need to be strong, for though it is small it must do a great amount of work. In twenty-four hours it does as much work as would be done by a man in lifting five hundred stones weighing fifty pounds each. Think of it! And it works at that rate for a lifetime. Never for a moment can its work be laid aside. The small pause between beats gives it some rest. It rests most when we are asleep. Why?

Take care of the heart!

Exercise makes the heart send the blood surging to every part of the body, nourishing it and washing away its waste. This, of course, is good for the body. But care must be taken to avoid injury to the heart by too violent exercise. You should know that violent exercise, as running so hard or riding a wheel so fast as to get very much out of breath, may injure the heart by overworking it.

Careful experiments have shown that even a small amount of alcohol may make the heart beat four or five times more each minute than it otherwise would; that is, 6000 or 7000 extra beats in twenty-four hours. This is as much work as would be required to raise a fifty-pound weight one foot, two hundred and eight times. Besides, the heart has to beat so much more rapidly to do this extra work that its rest pauses are shorter. Thus it has to do more work even while it has less time for rest.

When a person has the habit of smoking any form of tobacco in excess, his heart is affected, and generally beats more times a minute than the proper number. It may beat even so rapidly as 112 times a minute. Think what a lot of extra work such a heart must do. The extra beats are labor lost, and tend to wear

out the heart. After a while it may get so tired that it cannot force all the blood needed to every portion of the body. Then the whole body may become diseased.

REMEMBER: The heart is to the body what the mainspring is to a watch. Every organ depends upon its healthy action. Do not overtax it, or weaken it by alcohol or tobacco.

HEALTH PROBLEMS

1. Does your heart beat while you are asleep? How can you tell?
2. Can you tell whether the stream of blood goes up into your head, out into your hands, and down into your feet? How?
3. Put your finger on an artery and then on a vein in your wrist. What is the difference between the way a vein and an artery feel to you?
4. Have you noticed that when you hurt any part of the body, or when any part of it is sore, there is usually a swelling about the place? Explain this.
5. Why does the heart beat so rapidly when one has a fever?
6. If the doctor calls when you are sick, why does he always feel your pulse?

REVIEW QUESTIONS

1. On what side of the body can you feel the heart beat?
2. How can you make the heart beat hard and fast?
3. When does the heart beat slowest?
4. How are the materials needed for building and repairing the body carried around to different parts?
5. How much blood does the heart pump in one day?
6. The blood is what part of the weight of one's body?
7. How is the heart constructed?
8. Describe the reservoirs in the heart.
9. What is the use of the capillaries? The veins? The arteries?
10. What gives the red color to the blood?
11. What do the red blood cells do for the body? The white cells?
12. How does the blood get the fluid in which the cells are carried about?
13. How can one best keep his blood in good condition, so that it can do its work easily and thoroughly?
14. How does too little sleep affect the blood cells?
15. How does alcohol affect the blood cells?

CHAPTER IX

Outdoor Life

Most people like to be out-of-doors. This is natural, for we were made to live out-of-doors. Man's first home was the out-doors among the trees and plants, and his first occupation was outdoor work. Out-of-doors the air is fresh and there is plenty of it. Indoors there is only as much air as the space in the house, not filled with furniture and other things, can hold; and indoor air is often neither very fresh nor very clean.

Pure air

There is always some dust in the air, but indoor air contains several times as much dust as does that out-of-doors. The leaves and grass and plants, because they are moist, catch and hold much dust so that it cannot fly about. The snow and the rain, washing the dust to the earth, clean the air. The winds, too, often help to make the air cleaner. Indoors we lack these aids in cleaning the air. And our carpets, rugs, curtains, and other household furnishings are so dry and fuzzy that dust clings to them. Then when people move about the rooms dust may be shaken off, and it goes swirling into the air for us to breathe.

All dust is harmful, and it is sometimes dangerous. House dust is especially dangerous to health. It often helps to bring on those dreaded diseases, *pneumonia* and *tuberculosis;* so often, indeed, that these diseases are called *house* diseases. It has been found that the very best remedy for these diseases is to breathe outdoor air all the time.

If breathing fresh air will often cure such diseases as pneumonia and tuberculosis, do you not think that breathing this air would be one of the very best ways to keep from getting these diseases? In the warmer seasons, one can play, work, and study out-of-doors. One can spend a good deal of time on the porch, on the

"We like to play out-of-doors in winter as well as in summer."

roof, or on the lawn. If one lives in a village or in the country, it will be easy to spend much time out-of-doors. But in a city it may be more difficult. This is one reason why the country is often better for health and good spirits than the city. But there are so many advantages in the city that if we take pains we can make our lives in the city very healthful and happy.

Even in winter we should each day spend an hour or two out-

of-doors. Brisk and vigorous exercise will keep us from feeling the cold. The cold, fresh air of winter is even better for good health than the warm air of summer. Why should this be so?

THERE IS ALWAYS FRESH, SWEET, HEALTHFUL AIR IN THIS SCHOOL.

Of course one cannot neglect duties which must be done indoors, but one can often make plans, so that much that is commonly done indoors may be done out in the open air.

In some places there are open-air schools. In the cold season the pupils are kept comfortable by warm over-garments, caps, and gloves, with their feet and legs in what are called "sitting-out bags." In other schools, suits like those worn in the cold North by the Eskimo children are used. The children think it great fun to attend these fresh-air schools, and they seem often

to learn faster and easier than when they study in close, warm rooms. What is the reason for this?

If you cannot go to such a school, there is at least a way for you to get a good supply of clean outdoor air, — and that is to sleep in fresh air at night. To breathe fresh air while we are asleep is one of the greatest aids to keeping good health. Sleeping out-of-doors is a splendid health habit, and many people are now doing it in the city as well as in the country. These people always say they feel better when they sleep out-of-doors than when they have to sleep in bedrooms. Can you explain this?

Sleeping in the outdoor air

"EVEN IF IT IS FREEZING OUT-OF-DOORS, I SHALL SLEEP WARMLY IN THE FRESH AIR ALL NIGHT."

Many people have sleeping porches on their houses, while others sleep in screened tents in the yard or on the roof. Some who cannot do this use a window tent or a fresh-air tube. One can at least sleep with windows open, and thus get a good deal of fresh air. Anyone who has tried it knows it is a joy to sleep in the open air in summer.

It is great fun in winter, too, if one does it in the right way. For winter the night garments must be very warm, and must fit somewhat snugly, so that the cold air cannot get near the body. The cold air is for the lungs only; the rest of the body should be warm while we sleep. One cannot depend for warmth upon bedclothes laid on in the usual way. It would take so

many to keep the body warm that their weight would tire the sleeper.

The best way to do is to have a sleeping outfit to put on each night, just as we have overcoats, caps, and mittens when we go sleigh-riding. This covers the whole body, except the nose. The nose needs to be left out, of course, so that one can breathe the cold air. Most people enjoy leaving the whole face uncovered to the cold air.

First, the bed should be warm. It can be made so by placing a jug of hot water upright, so that the covers form a sort of tent over it, and leaving it there for an hour before bedtime.

There are electric blankets by which a bed may be made warm and kept warm for the outdoor sleeper; or the bed clothing may be kept warm indoors, and carried out to the bed when needed.

Creep into such a warm nest, well prepared to sleep warmly, and after a night spent thus in the cold air you will feel as fresh in the morning as you do when you have been out coasting.

REMEMBER: If we want to live long and keep our health, we must spend much time out-of-doors while young, and when older choose for our life work if possible one that will keep us much in the open air; and we must always sleep in cool, fresh air.

HEALTH PROBLEMS

1. Mention some way to find out whether there is much dust in the air of a room.

2. If you live in the city, tell how you would keep the streets from being dusty. If you live in the country, say whether the roads are very dusty, and if so, how the dust could be reduced.

3. Do you know anyone who sleeps in a room with the windows all closed? If so, does he have good health all the time? Does he have colds and coughs?

4. Ask some one you know who sleeps out-of-doors to tell you what he thinks of outdoor sleeping, so that you can give a report on it to the class.

Review Questions

1. Is it natural for people to like to be out-of-doors? Why?
2. Is the air better out-of-doors than indoors? Why?
3. Why is there likely to be more dust in the air indoors than outdoors?
4. Is dust liable to harm one's health? Why?
5. What are the *house* diseases? What may cause them?
6. How much time ought one to spend out-of-doors?
7. What could one gain by sleeping out in the open air?
8. If one sleeps out-of-doors in winter, how may he keep his body warm even in the coldest weather?

CHAPTER X

Fresh Air Indoors

A person may go without eating for a month, or without drinking for several days, and still live; but if a strong man were deprived of air, he would die in a few minutes. We have seen that the best air is outdoor air. Even when we must be indoors we should try in some way to get enough pure out-of-door air to breathe.

There are several ways in which air is made impure. We have seen that dust makes air unhealthful. Anything that rots or decays soon gives forth a bad odor. People often have rotting potatoes and other vegetables in their cellars, and swill barrels and garbage heaps at their back doors. All these spoil the air. Bad odors in the air from decaying stuffs are a warning of danger, and we should have rotting things, whatever they may be, taken away from the house or yard as soon as possible.

How air becomes impure

The chief reason why both dust and bad odors are harmful is that they generally carry with them little living things called *microbes* or *germs*. These are so small that they cannot be seen by the naked eye. It takes a strong miscroscope to make them out. There are a good many kinds of them, and they are capable of doing us so much harm that if we receive them into our bodies they are likely to make us ill, and they are often the cause of death.

The native home of the microbe or germ is the soil. When the warm sun dries the dirt on the ground into dust, and the

wind blows it about, very small seeds, or *spores* as they are called, cling to the atoms of dust. In this way they become scattered abroad everywhere out-of-doors and indoors. So long as they

THERE ARE ABUNDANT SUNSHINE AND FRESH AIR IN THIS COZY SUN PARLOR.

remain dry they do not grow. In order to thrive pest microbes must have:

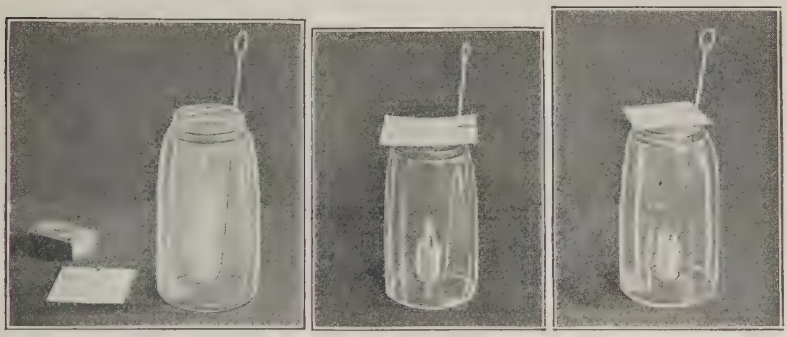
(1) Food; (2) moisture; (3) warmth; (4) more or less of darkness.

When once they touch something that happens to supply all these needs, they grow and multiply so fast that one cannot keep count of them.

A microbe, if it had food enough for it to feed on and con-

ditions favorable for growth, might produce more than two hundred and fifty billion microbes in one day. A microbe is so small it could do no great harm if it were not for its very rapid growth.

Fortunately most of them do us no harm. Many of them are really our helpers, because they feed on harmful germs and destroy them. Certain ones, however, are the cause of such diseases as *tuberculosis*, *typhoid*, *diphtheria*, and other deadly ills.



THE CANDLE EXPERIMENT. (1) BURNING BRIGHTLY; (2) BURNING DIMLY; (3) GONE OUT. EXPLAIN.

Another way in which the inside air is made impure is through the change produced in it by the breathing of people and animals.

We can easily prove this fact by a simple experiment. For this we shall need a fruit jar, a candle, and a piece of wire about a foot long. The candle is fastened to the end of the wire and let down into the bottom of the jar. Now we shall place the cover on the jar and see what happens. You notice that the candle soon begins to burn dimly, and before long it goes out altogether.

Why will the candle not burn in the closed jar? Try the experiment again, and when the candle light begins to get dim,

bring it out at once into the air. What do you find? Explain the facts which your experiment shows you.

If instead of a candle we should shut up a mouse in the fruit jar, it would live only a little while. Its life would go out, just as the light of the candle went out. A child shut up in an air-tight box or small space would soon die from the same cause.

WHY DOES THE LIMEWATER BECOME MILKY?

Something besides heat comes from the burning of wood or coal. The smoke escapes through the chimney, and the ashes remain in the stove; these are the waste parts of the fuel.

A kind of burning or *combustion*, as it is called, is going on in our bodies all the time. This burning produces something like the smoke and ashes made by the fire in the stove. Get a drinking glass, and a glass tube or a good stout straw.

Into the glass put limewater, which you can get from a druggist. Breathe two or three times through the tube or the straw into the limewater. You will notice that it begins to look milky. Soon it becomes almost as white as milk. This is because the limewater catches and holds the *carbon dioxide* which we breathe into it.

Every time we draw in a breath of pure, fresh air, the body keeps and uses some of the oxygen, and in its stead carbon dioxide is breathed out. So each time we breathe out we make the air around us impure by the breath we expel. If we are out-of-doors, the used air from the lungs is carried away. But if we have only a roomful of air on hand, we shall in time be breathing spoiled air unless we have some means of supplying fresh air.

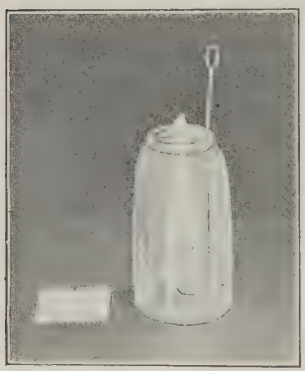
If one were in a closed room into which no fresh air could get, and the air were *dead*, as we say, it would become so impure that the person in the room would be poisoned and die. Many years ago when the British people were having war with India, one hundred and forty-six English soldiers were taken prisoner. Their captors thrust them into a room twenty feet square. It had two very small windows, but the amount of air that could trickle in through these was not nearly enough for so many soldiers. In a very short time the oxygen in the air became so nearly exhausted that the soldiers began to suffer great torture. By morning only twenty-three of the whole number were alive. This room in which so many died for want of air is known in history as "The Black Hole of Calcutta."

There are other changes in the air caused by breathing which may be much more important than the exchange of pure oxygen for carbon dioxide gas. One of these is the addition of moisture. There may be others not yet fully understood. It is certainly known that air which has been once breathed is not the best to breathe again, and that a liberal supply of fresh air is constantly

needed to carry away the used air which we send out from our lungs.

Changing the stale air indoors

The only way to obtain the fresh air needed when we live indoors, is to have some means provided by which the outdoor air may be brought in to us, and the air which has been used and has become impure within may be carried out. Changing the air in this way is called *ventilation*. Every house, schoolhouse, church, store, or other building where people work or play or live ought to be well ventilated. Many persons ventilate their houses by leaving the doors and windows open. This serves well in warm weather. In cold weather it is not a very good way, as it causes drafts and makes the floor so cold that it is hard to keep the feet warm. It is much better to have the air brought fresh from the outdoors, then warmed by a heater before it enters the rooms.



CANDLE EXPERIMENT SHOWING THAT AT LEAST TWO OPENINGS ARE NECESSARY TO INSURE GOOD VENTILATION.

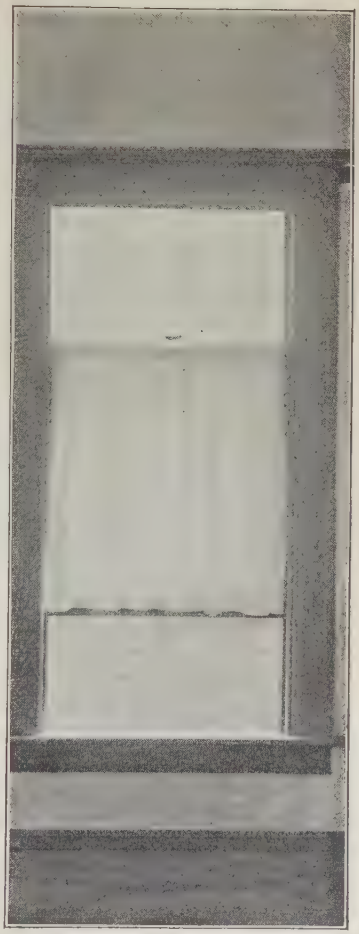
Air does not move of its own accord. A current of air must be produced in some way so as to move in and out of rooms. To ventilate a room there must be both an *inlet*, a way for fresh air to get in, and an *outlet*, a route for the foul air to get out.

Try this experiment: Take a tall glass jar. Attach a small piece of candle to the end of a long wire, as shown in the picture. Light the candle, and lower it into the jar. At first it burns brightly. By and by it grows dim and finally goes out, leaving just smoke. This happens, as we have learned, because the carbon dioxide which is made by the burning of the

candle, and which is heavier than the air, settles in the bottom of the jar and puts out the flame. Let us put in the jar a piece of pasteboard, notched at the bottom, thus making a partition in the jar. Light the candle and place it in the jar. Now the candle continues to burn brightly because the fresh air comes in on one side and the foul air passes out on the other; that is, the jar is ventilated, as our living and work rooms should be, by means of at least two openings.

People shut up in a room without ventilation will be injured and in time will die just as you saw the candle go out. Their lives do not go out so quickly, but by degrees they will get sick and die, if they continue to live in unventilated rooms.

If there is no way of ventilating a room except by windows, two openings of some sort must be provided. The upper sash may be lowered a foot to allow the used air to pass out, and the lower raised a foot to admit the fresh air; or if there are windows on opposite sides of the room, open each a little way, one for the fresh air to come in, the other for the used air to get out.



THE UPPER SASH IS LOWERED, AND THE LOWER ONE IS RAISED.

How far the windows should be open must depend upon how many persons there are in the room; also how many pet animals there are; whether there are gas jets or lamps burning; how large the room is; and how much furniture there is in it. When a strong wind is blowing, and in very cold weather, small openings may be sufficient, while large ones are needed when the air is quiet. Each gas jet or lamp spoils as much air as two or more persons.

DRAFTS MAY BE AVOIDED BY THE USE OF A WINDOW BOARD AT THE BOTTOM OF A WINDOW WHICH IS OPENED FOR VENTILATION.

There are several ways in which houses are ventilated, but the general plan is the same for all, — an inlet for fresh air, and an outlet for used air, with something to make a draft between them. If the air enters directly from out-of-doors, the outlet must be near the top of the room, because the warm air rises, and the air already in the room is warm air that has been used.

If the air is warmed by a furnace or some similar means before it enters the room, the outlet should be placed at the floor, because when the pure air enters the room warm, it first rises to the upper part of the room, and then as it cools, and at the same time becomes impure, it settles to the floor, where it should be taken out.

The air of sleeping rooms should be as nearly like out-of-door

air as possible. Windows should be opened wide, and a free movement of air secured.

Air that has become foul through use has a musty odor, and when we first come in from outdoors we can smell it. After one has been in a badly ventilated room for a time, one's nose gets used to the odor, and so one does not notice the bad air. It

YOU CANNOT WORK OR STUDY WELL IN BAD AIR.

is a good thing to "follow our noses" when we detect the close, stale smell. If we heed this danger smell, and seek some way to change the air, we may save ourselves much discomfort and harm. When the air in a room becomes spoiled, the people in it are likely to feel stupid or sick, or to get headaches.

REMEMBER: You cannot work or study well in bad air, and you cannot keep your good health unless you have a supply of fresh, unspoiled air all the time. Air that is not in motion — dead air — is especially harmful.

Health Problems

1. If you live in the city, do you have a garbage man remove your garbage frequently? Does the city require the removal of the garbage? Why

2. What is usually done with the garbage in a small village?

3. What arrangements should be made for garbage removal?

4. What decaying things about country homes spoil the air? How can this evil be remedied?

5. Name some disease that is caused by the microbes or germs carried about in dust or bad odors

6. Why are we so made that we dislike dust and bad smells?

7. How is your schoolroom ventilated? Where does air enter it? Where does the used air leave it?

8. How are the living room and the dining room in your home ventilated?

Review Questions

1. If we must stay indoors a good deal, what should we try to do about the air we breathe?

2. In what ways may air be spoiled for our use?

3. What is the chief reason why dust and bad odors are harmful to health?

4. What happens to the air which is breathed into the lungs?

5. What is meant by the *combustion* that goes on in our bodies all the time?

6. What is meant by *carbon dioxide* thrown out from the lungs in breathing?

7. How could you show that carbon dioxide is in the air we breathe out?

8. How can we have a supply of fresh air if we live much indoors?

9. What is meant by *ventilating* a house?

10. What is the proper way to secure good ventilation in a house?

CHAPTER XI

Keeping the House Healthful

In both city and country, there are many details to be observed for health. One of these of chief importance is the location of the house in healthful surroundings.

Thomas and Henry were schoolmates. At the start they were in the same class. Being very nearly the same size, and about the same age, their schoolfellows often called them "the twins." For several years their average in grade was nearly equal. They were always willing to do their part in the schoolroom and on the playground.

How one's home surroundings may affect one's health

After a time, at about the age of twelve, a change came in their appearance and in their work. Thomas kept up his growth in height and in strength. His ruddy cheeks showed his good health. A strong body helped to give him a good mind, and in his studies he was still as good as the best in his class.

Henry, however, grew but slowly after the age of twelve. He looked pale. His step lost its spring. He often seemed listless, and was sometimes dull in his lessons. He was usually so sleepy in school that he had to be aroused to study or to recite.

His teacher wondered at his listlessness and his poor work. One afternoon she made a visit to the homes of both boys. Thomas lived with his widowed mother in a tiny white and green cottage near the edge of the city. There was space about it for grass to grow, and for children to play. A wide-branching

maple at one side made a cool, shady spot where one could work or study out-of-doors in summer. At the rear, which was as clean and tidy as the front yard, was a small vegetable garden,

WHICH IS THOMAS? HOW CAN YOU TELL?

and one for flowers. To mow the lawn and tend the gardens in summer were Thomas's special tasks. To do these things required two or three hours' work each day before and after school. But Thomas liked to be busy, and, though but fourteen

years old, he took great pride in doing a good job. Besides learning to do well what he had on hand to do, Thomas was cultivating health through this work in the open air. He was storing up energy for use in future years.

A visit to Henry's home revealed this fact: his family, which used to live in an open part of the town a few years before, had moved to apartments on the second floor of a tenement block. The four windows looking out upon the dusty street provided all the daylight the family could get, except a little that came in from two small windows at the rear. These rear windows overlooked a dark and dingy court filled with filth and rubbish. Fresh air was about as scarce as light. The only porch was the fire escape. The children had no place to play except on the sidewalk or in the dirty street. Indoors the home had a tidy look, and appeared comfortable and cozy. But coming in from out-of-doors, one noticed at once a stale odor. The family had become so used to this that they did not mind it at all or even notice it. But what do you think this foul odor would mean to one who understood the matter? Henry was as fond of flowers as Thomas; and while he had no garden plot, he had tried to raise some in pots. They rarely bloomed and often died. Why do you suppose the flowers did not grow in the tenement home?

After her visits to the homes of these two boys, their teacher said it was quite plain to her why Thomas was the better pupil. What do you think was her reason for saying this?

Where one lives and also how one lives make a vast difference in what he can do and how he can do it. A pupil must always be in good health to be able to do his best work. So good health helps one in getting an education, does it not? You must see that a healthful home is a great aid to health. The house itself, as well as the things in it and surrounding it, all have to do with its healthfulness.

No one knows just what the earliest houses were like. Probably man's first home was simply a shady nook, a bower, or a mere shelter beneath the thick-spreading branches of a tree. Would such an open-air abode be healthful? Why? In a warm climate and in the absence of wild beasts and other foes, it would be enough for protection, would it not?

OUR EARLIEST ANCESTORS LIVED IN HOUSES LIKE THIS ONE.

How man built his early home

When protection from cold and storms, as well as shelter, was needed, it is probable that a structure something like the one in the picture was made. Two small trees standing near together with their tops bent so as to meet were fastened with a rope of bark. These formed the beginning of the framework. To complete this, a circle was made of small trees uprooted for the purpose, and of dead branches which the wind had cast upon the ground. Twigs and stems woven into this rude frame would make quite a good protection from wind and storm and roaming beasts.

But trees were not always at hand, nor could they be moved from place to place. With the roots and branches broken off, small trees formed very good poles. The poles, stuck in the ground to keep them firmly in place and overspread with a covering made from the skins of animals, made a good tent.

Such a tent or hut could be carried easily from one place to

another. If a permanent home was desired, a similar framework interwoven with rushes or long grass made a strong hut.

As the number of people increased, and as they scattered over the face of the whole earth, they devised for themselves all manner of dwellings. These have been and are still made of many different materials and are of varying shapes and sizes. How many different sorts of houses have you seen or read about?

THE GREENHOUSE KEEPER TURNS HIS PLANTS EVERY DAY. WHY?

Whether the house be a tent or a tenement, a cabin, cottage, or mansion, the same health laws apply to each. Abundant sunlight, air, and thorough cleanliness are first among the needs. Do you think the poor and the rich alike can possess these if they wish them? Is it easier to get them in the country than in the city? Why?

Why we need sunlight in our houses

Neither animal nor vegetable life can flourish in the dark. Watch the greenhouse keeper, and you will notice he takes care to turn his plants day by day so that all sides will be equally exposed to the light. When this is neglected the plant growth is deformed. The portions that receive the most light grow luxuriantly. Portions

left in the shade are likely to be dwarfed. Some primitive people dwelt in caves. Probably they did this from necessity because of many foes. But the cave dweller probably spent the greater part of his waking hours in the sunlight, occupying his cave at night or in time of special danger only.

Some modern people build for themselves dwellings which shut out the sun and oftentimes the fresh air, just like caves. This they do, not from necessity but from carelessness or from choice. Why, do you think? Did nature ever intend that we should spend any time except night in darkness? Give reasons for your answer.

Most animals become inactive if they stay in the dark. Watch a little starfish lying in the water. When the sun shines, it puts its arms slowly forth, then draws them back again. Now let a cloud pass over the sun; the little creature at once folds its arms and becomes quiet. As soon as the cloud passes off, it becomes active again. When the sunlight disappears, some plants fold their leaves and droop their branches. Often flowers close up when darkness falls.

Our bodies are just as sensitive to light as are plants or starfish. Human beings, like plants, are likely to droop in the shade. So you can see why sunshine, as well as fresh air, is necessary for health.

Should a building, whether home, schoolhouse, factory, or shop, provide for abundant sunlight in every room? Show why, if you think so. Do working people need sunlight in their workrooms? Why?

If one can choose the place where his house shall be built, as the birds choose the places for their nests, he ought to select some open spot where the land has a gentle slope or the sunny side of a low hill.

When the snow melts or the rain falls, sloping land drains dry

more quickly than level land. Why? Should you wish to have a sluggish stream, a pond of stagnant water, a swamp, or anything of the sort near your house? Why? Should you wish to be where smoke and dust from factories and shops would spoil

MEN ENJOY WORKING IN THIS FACTORY, WHICH HAS PLENTY OF SUNLIGHT AND FRESH AIR. THEY CAN DO MORE WORK AND DO NOT BECOME TIRED AS QUICKLY IN SUCH A FACTORY AS IN A DARK AND POORLY VENTILATED ONE. IT WOULD BE BETTER FOR THEIR EYES IF THEY DID NOT FACE THE LIGHT.

the air you would breathe? For the city dweller, the best choice for a home would be in some high part of the town beyond the dust and din of the busy streets. A corner of two streets is likely to afford more sun and better air than can be had elsewhere. A most delightful place for a city home I once saw was a square of dwellings around a large court of green grass made

garden-like with shrubs and flowers. At the front, each house stood well back from the street, and had its own plot of grass.

ONE CANNOT KEEP THE HOUSE HEALTHFUL UNLESS IT HAS AN ABUNDANCE OF LIGHT AND AIR.

A damp spot is a bad place to build a house

When we have found a sunny, airy place for a house, we ought next to make sure that the ground is not the kind that holds water. You know that a great deal of water falls upon the earth in rain. Some soils readily allow this rain to drain through. Try this experiment: Fill four tumblers each nearly full, one with gravelly soil, one with sand, one with garden dirt, and one with clay. Press the soil down well in each tumbler and then pour one-fourth of a cupful of water slowly over each, and note in which the water sinks most rapidly. You will see that the water will

pass quickly through the gravel. But unless there be cracks to let it through, the water will remain standing on the clay for some time. Which of these soils do you think would furnish the best ground on which to build one's home? Why?

If one cannot have a good *porous* soil upon which to build a house, then moist ground may be made dry by lines of tile drain pipes laid beneath the foundation of the house. To have a drain around the outside of the foundation walls of the house to carry off the moisture is always a good plan.

Do you know that there is air as well as water in the ground? Suppose you try this experiment: Take a long, narrow lamp chimney. Fit each end with a good cork. Make a hole in the center of each cork, and insert a small glass tube. Put a layer of cotton inside next the cork. Remove one cork and fill the chimney with earth and replace the cork. Place the end of one of the tubes near a candle flame. By blowing into the other end, the flame will be made to flicker, showing that the earth is *porous*.

The air in the soil is not so pure as that above the ground. Dead matter of various sorts is buried in the ground in many places. This matter gives off foul gases. Besides, there are often leaky gas and sewer pipes underground. In a good many ways, therefore, the air beneath the surface becomes impure, and we ought to prevent this ground air from getting into our houses. You see, then, that the foundation walls of some houses which are laid on or beneath the surface need to be both moisture proof and air proof.

If ground air or damp air gets into the basement of the house, the parts above will act much like a chimney. The air in the living rooms, warmed by the sunlight or the heater, will constantly be rising, and the cooler ground air will be drawn up to take its place. Thus there will be a constant upward current of the foul, damp air from the ground.

You can try this experiment yourself easily. Shut all the doors and windows in the cellar. Place an open bottle of some substance with a strong odor, like ether, in the cellar. Then go to the room above. After a little time, you are likely to notice this odor there. In this way, you will discover that some of the air below has made its way into the upper rooms.

Experiments have shown that much of the air from a cellar ascends to the rooms of the first floor, two thirds as much to those of the second floor, and one third as much to those of the third floor of a house. You see, then, that what is beneath a house counts for a great deal in making it healthful or otherwise. In warm countries, houses are often set on piles. This plan is a very good one, if the piles are high enough to allow the air to circulate freely underneath the house.

A basement with damp-proof walls should extend under the entire house. It will make the rooms above drier and will keep the floors warmer in winter. One day I inspected the cellars of several houses. One of these is just a hole dug in the earth and walled about with stones. When there are heavy rains and thaws in the spring the water trickles in between the stones. Sometimes it fills the cellar a foot in depth. There are but two windows, and both are on the same side. If the cobwebs were not so thick, one could see that each window has three small panes of glass. The windows are fastened down with nails. The place is dark and damp and dirty. Have you ever seen such a cellar as this?

The cellar, the part of the house most to be considered

Near by is another cellar. When it was built, pipes were laid to drain the ground. The base of its walls is made of concrete, as is also its floor. The wall is built in two tiers. The space between these tiers is filled with asphalt, which makes the wall damp-proof. Inside, the walls and ceiling are plastered

and painted white. All pipes are likewise painted white, so that any dirt may be plainly seen. Then, too, there are plenty of windows that open with ease to let in light and air. The place is dry, light, and easy to keep clean. Have you ever seen a cellar like this? Above which of these cellars would you rather live?

Should you think the plan of storing rubbish and things that decay or mold in a cellar a safe one? Do you think care and attention in regard to cleanliness and fresh air are as necessary for the basement and cellar as for other parts of the home?

Much can be done to keep the cellar clean by bringing into it no unnecessary dirt. When vegetables are to be stored in the cellar, it is well either to brush or wash them first. Everything should be so placed and arranged that frequent cleaning will be easy. No decaying foods like potatoes, apples, or the like, should be permitted to remain in a cellar for even a day.

A healthful house has no dark closets nor other places in which to keep refuse in disorder. Why? Even the tiniest clothes room should have some way for light and air to enter. Darkness favors dirt and develops germs. Wherever there is darkness or things accumulate out of sight, there is the place to be watched and kept clean and airy.

REMEMBER: A healthful house must have an abundance of sunshine and fresh air, and must be clean from cellar to garret.

HEALTH PROBLEMS

1. Pick out some one you know well who is very healthy, so that he does not have to be out of school because of sickness. Tell the class in what kind of home he lives, — whether in a crowded street in the city, or in open spaces in the suburbs; whether there are many windows in his house, or only a few; whether he is out-of-doors much of the time, or whether he is in the house when he is not in school. Try to give these facts accurately.

2. If you have a small pot of flowers growing in your house, see if your parents will permit you to put the flowers in a dark place, say in a dark corner of the cellar. Leave the flowers there for a few days, and then tell what has happened to them.

3. Should there be a law in every town and city which would prevent people from building their houses without leaving open spaces between them? Why?

4. What should one do with a house filled with musty odors?

5. What may one do who lives in a large city in order to get fresh air and sunshine?

6. Usually one feels much better when he spends the day in his living room rather than in his cellar. Why is this so?

Review Questions

1. Tell the story of the two boys who were the same age, and who were about the same size up to the age of twelve, but who did not grow at the same rate afterward.

2. What sort of smell is found in rooms that have little light and air?

3. Can one get so used to musty odors that he will not notice them? If so, does this mean that they are not harmful to him?

4. Can one do as good work when he lives in a dark, ill-ventilated house, as when he lives in a bright one where he has plenty of light and air?

5. Did the men of long ago live in houses such as we have to-day? How did they protect themselves from the winds and storms? Is it healthful to live in a tent if the weather is not too severe?

6. What must one have in a house in order to keep one's health?

CHAPTER XII

Lighting the House

I once saw some fish brought from a stream that flows through a large underground cave. They looked much like the fish which one can find in lakes and streams about his own home, except that they had no eyes. Why do you think these cave fish did not have eyes?

Light is necessary for health

Nature has given eyes to all creatures living where there is light. Most animals and vegetables grow best in places where there is light, at least during the daytime. This is as true of human beings as it is of animals and vegetables. You have already learned that people who live in dark places, such as basements, cellars, and the like, are usually unhealthy. Do you know that people who always work underground during the daytime find it difficult to keep good health? Have you heard also that people who live in the shadows in the deep valleys of the Alps Mountains often suffer from the lack of sunlight?

Recently some men who had been exploring in the Arctic regions told us that the long night was a far greater hardship than the severe cold. Have you noticed that you feel better on a very cold day if the sun shines than if it is cloudy?

Probably everyone has been in a cellar where vegetables are kept, and has observed potatoes sprouting and trying to grow even in the darkness. Have you noticed how pale the young shoots are, and how they struggle to get to the light? Have you

observed that any vegetable starting to grow in a cellar will bend in the direction of a window or a door through which some light enters? Why does it do this?

WHY DO THE SPROUTS ON THIS POTATO LOOK SO WHITE? WHY ARE THEY ALL TURNED IN ONE DIRECTION, SIDEWAYS?

If you will notice persons who are accustomed to live or work in basements or in other places into which but little light enters, you will probably find that they are pale and weak, as compared with persons who live and work in rooms in which there is a good deal of light. Many cities are now seeking to do away with all dark streets and alleys. In places where this is impossible, large, airy, light playgrounds are provided for all the children in each section of the city. Some of the large cities now have playgrounds on the roofs of the tall buildings. If these roofs are properly protected, do you think that they would make good playgrounds? Would you like to play in a roof playground such as is shown in the picture?

Windows are as necessary to let the sunlight into our homes as to enable us to see what is occurring outside. A neighbor of mine always leaves the upper part of her windows without shades or curtains so that the light may enter freely, because she has noticed that the light comes mainly from the top of the windows. Have you noticed this fact?

How to obtain plenty of light

You would think everybody would know that clean windows let in more light than soiled ones, yet there are many persons

who appear not to have observed this, for they do not keep their windows clean. Not long ago a test was made of the windows in a number of schoolhouses. The test was made by means of a *photometer*, which is an instrument that measures light just

"WE HAVE LOTS OF LIGHT AND FRESH AIR UP HERE IN THIS OPEN-AIR GYMNASIUM ON THE ROOF."

as a thermometer measures heat. This photometer was used in the schoolhouses to show how much light was coming through the windows. In some of the rooms the windows were quite clean, and in others they were very dirty. The light entering through the windows was measured at three different times: first, just before they were cleaned; second, just after washing

one side of the windows; third, after washing both sides of the windows, so that they were perfectly clean.

You may not be surprised to learn that even with the cleanest windows there was a considerable gain in the amount of light which came through them after they were washed. In the case of the dirty windows about one third more light came through

ONE'S BEDROOM AS WELL AS HIS LIVING, DINING, AND WORK ROOM SHOULD HAVE PLENTY OF LIGHT

after they were cleaned. What does this suggest regarding the necessity of giving attention to the windows in a house?

The value of light

You can see now why it is important that every building used as a workshop or a home should have numerous windows and that they should be kept clean. These windows should be placed so that every room, whether used for living or for sleeping, should have a bath of sunlight for part

of every day. Rooms that face the sun rent for more than those that do not receive much light. Do you think a person would find it cheaper in the end to pay the higher rent of a sunny room than the lower rent of a dark one?

It is generally true that when rooms are dark, you can find dirt hiding away in the corners. If for no other reason, then, rooms ought to be well lighted so that any dirt in them can be seen easily. You have already learned why dirt and dust should be kept out of the house. Do not forget that cleanliness is the first condition for good health.

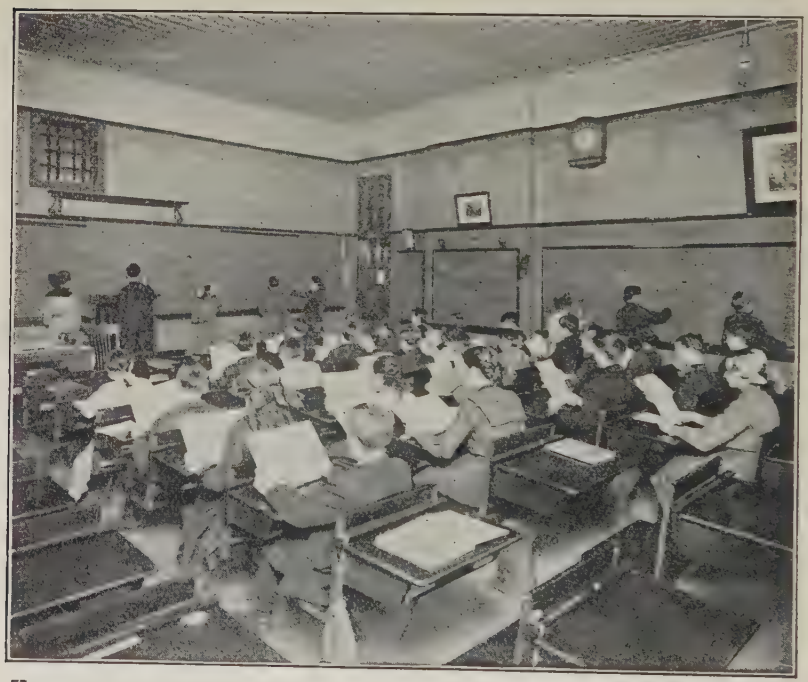
In very warm countries the people practically live out-of-doors. They often cook and eat in the open. In some of the cities in these countries, the cafés and lunch rooms are out on the street. Would it be a good plan if in this country we lived out in the open more than we do, cooking and eating our food out-of-doors? Do you like to go on picnics and eat your luncheon out-of-doors?

Artificial light is quite different from natural sunlight. Men have tried to grow vegetables by artificial light, and while they have accomplished something in this direction, they have not been able to make any kind of artificial light which will do the work of sunlight. In the congested parts of all our large cities there are many rooms in which there is nothing but artificial light. Many of the houses in which the people live have too few windows. They could just as well have more windows if people appreciated the value of them. Often one sees houses which are made dark because of too many trees or other obstructions.

Most of the light in a house, except direct sunlight, comes from the sky. When you look out of the windows of your classroom or your house, you should be able to see the sky. If you cannot, little light can enter your classroom. You can see, then, why, in building a house, one should plan the windows so that

they will let in the light from the sun and the sky. The amount of light that will come through a window will also depend on its size.

Have you noticed that when a window opens upon another building, it will give very little light if that building is painted



HERE IS A WELL-LIGHTED SCHOOLROOM. THE LIGHT IS DISTRIBUTED OVER THE ROOM EVENLY.

black, but if the building is painted white, the window may let in a good deal of light? How can you explain this? If it is impossible to get light enough for a room through windows, then the light can be increased somewhat by having the walls and ceiling painted white.

If people would do all their work by daylight, it would be best for their health and their eyes; but in these times most people do not like to stop their work when the sun goes down, and so they must use artificial means for lighting. In early times, torches and candles were the principal means of supplying artificial light. It is told of Abraham Lincoln that when he was a boy he studied in the evening, after his long day's work, by the light of the fire or a pine-knot torch. Do you think this would make a good light for reading and studying in the night time?

The use of artificial light

THIS BOY'S EYES WILL SURELY BE INJURED.

In lighting a room, would it be better to have one strong light in the center of the room, or to have several lights of less strength in different parts of the room? Would there be any danger from having too bright a light? You know it hurts your eyes to look at the sun. Have you noticed that your eyes are likely to pain you when you try to read a page with the sun shining directly upon it?

Perhaps you have noticed that when you are reading or doing any close work, it is better to have the light over your left shoulder than directly in front of your eyes. No one can look at a bright light without doing some injury to his eyes. The

structure of the eye is such that it cannot stand a very bright light shining directly into it. Frequently children injure their eyes by using them when there is too much or too little light. Often people get headaches and other troubles because they do not take proper care of their eyes when doing their work or when reading. Men have recently found out that a soft amber-colored light is better for the eyes than a pure white light.

When there is but little light, the *lens* of the eye expands so that enough light may enter, but when there is a good deal of light it contracts in part so that the delicate membranes of the eye may not be injured by too much light. But if the change from light to dark be too sudden, the eye cannot adjust itself without great strain. A flickering light is on this account bad for the eyes. The reason for this is that the eye has to change so often and so rapidly that it overstrains the muscles that control it.

The unsteady candle-light bad for the eyes

Often one sees lamps in which the chimneys are not clean. It is especially important when an oil lamp is being used that all parts of it should be kept clean in order to produce better light. A boy of my acquaintance, who cares for the sitting room lamp for his mother every morning before school time, has a good way to keep it clean. First, he spreads a newspaper on the table on which he is going to work; then he brings the lamp, the oil can, a pair of scissors, an old knife, a basin of hot water, some soap, a round brush with a wire handle, some soft paper, a piece of flannel cloth, and another soft clean cloth which has no lint on it. When he takes off the chimney, he turns the wick just low enough to show the burned portion. With the back of the old knife, he scrapes off as much of this as he can. If the edge of the wick is not left smooth, he trims it a little with the scissors, rounding the corners of the wick slightly, so that it will not flare up

How to clean and care for a lamp

when it is lighted. Next he removes the top from the burner and wipes it clean with soft paper; then he fills the lamp with oil, always leaving at least one half inch of space which is not filled, because he knows that oil expands, and if he filled the lamp full, the oil might overflow. Then he puts all the parts together, and wipes the outside of the lamp with the flannel cloth. Finally he washes the chimney in hot suds, using generally a soft brush to clean the interior; and then he polishes the glass dry with a clean flannel cloth.

CLEANING A LAMP IN THE RIGHT WAY

Of all the methods of lighting in use to-day, electricity is the safest and most healthful. It comes closest to being like daylight. It is usually a strong and steady light. One good thing about it is that it does not spoil the air as do candles, lamps, and gas jets. It has been calculated that a gas jet uses as much oxygen as two persons. A kerosene lamp may use up as much oxygen as four people.

Electricity the best artificial light

REMEMBER: It is impossible to have good health without an abundance of sunlight; and it is impossible to keep one's eyes in good condition without a good, clear, steady light by which to read and work at night. It is best to do as much of one's work as possible by daylight, which is better for the eyes than artificial light of any kind.

HEALTH PROBLEMS

1. Take a potato which is sprouting in a very dark corner of the cellar, and put it into the sunlight for two or three days. Then describe the change that you observe in the color and size of the sprouts.

2. Note how your neighbors use the shades on their windows. Do they cover the top part or the bottom part of the windows?

3. Observe what styles of windows are used in the houses on your way to school. Are the panes small, or do the windows have large plates of glass?

4. How do the people living in warm countries where very little light is admitted into the houses manage to secure enough sunlight?

5. If you had a photometer in your schoolroom, do you think it would show that the windows let in all the light possible because they are perfectly clean?

6. From which direction does the light in your schoolroom come — from the front or the rear, over your right shoulder, or over your left? Is every corner of the room lighted equally well?

7. Does the direct sunlight ever fall upon your book as you are studying? If so, is this good for the eyes?

8. When you are reading or studying at home, do you have the light in front of you or behind you, or at your left or at your right? Where should it be?

9. Do you know any persons who read or study with the light shining directly in their eyes?

REVIEW QUESTIONS

1. What is the effect upon the health of people of living in deep valleys into which the sunlight rarely enters? Explain.

2. What is likely to be the effect upon the health of men of spending long winters in the Arctic regions?

3. What is the effect upon the health of children of growing up in dark streets and alleys?

4. What is the best way to shade windows?

5. Why should windows always be clean?

6. Tell the results of the test that was made in several schoolrooms with the photometer.

7. Should all living and sleeping rooms be situated so that they can receive sunlight during each day? Why?

8. Why do people who rent rooms prefer those that face the sun?

9. Would it be well for people in this country to cook and eat their food out-of-doors more than they do? Why?

10. What may prevent the light from entering a house in which there are a sufficient number of windows?

11. When a room does not have enough windows, or is situated so that it cannot get enough light from the sky, how may it be treated inside so as to increase the light?

12. What is meant by artificial light? What are the kinds of artificial light?

13. What kinds of artificial light are used most to-day in our cities?

14. What kinds of artificial light are used most in the country?

15. What is the best kind of artificial light?

16. What kind of artificial light uses up oxygen in the air most rapidly?

17. Why is good ventilation especially necessary when one uses gaslight or oil lamps?

18. Is it better to light a large room by means of one very bright light, or by means of several lights not so bright?

19. From what direction should the light come when one is reading or studying?

20. Why is a flickering light injurious to the eyes?

21. What care should be taken to avoid accidents in the use of gas for lighting?

CHAPTER XIII

Cleaning the House

If most of one's life were spent out-of-doors, it would not matter so much what sort of conditions one had in one's house. But when one remains indoors much of the time, as many of us do, it becomes of great importance that we should have clean houses. Cleanliness is the first rule of health, and we must now see how we are to secure clean buildings, whether it be a schoolhouse, a store, a shop, or the house in which we live.

Keep the house free from dust

In securing a clean house, to what should one first give attention? Probably every one will answer, "To the removal of dust." It is pretty hard to get rid of dust,— harder than to keep out scraps of paper and other refuse. People can generally see large things which make the house untidy and they will try to remove them; but a great many persons are not sensitive to dust. It does little or no good simply to try to brush dust out of the house, because brushes and brooms usually just stir up the dust and send it into the air, from which it will settle again on the objects in the room.

Have you ever thought of the number of things in the street that help to make dust? Usually when people think of dust, they think only of dry mud. But there are certain other things that make dust which may get into the house. For one thing, garbage carts help to make dust. Sometimes the cans are so full that bits of rubbish fall off on the street, and are soon ground up into fine particles that fly about as dust. If you will watch horses as

Many things help to make dust

they are driven by, you will sometimes see foam and saliva dropping from their mouths to the street; these dry and help to make dust. Careless people fling away on the street orange peels, banana peels, tobacco quids, cigar stumps, apple cores, peanut shells, and gum they have chewed; and all these things may in time become dust.

GARBAGE SHOULD BE REMOVED FROM ONE'S HOUSE EVERY DAY, AND NONE OF IT SHOULD BE PERMITTED TO DROP ON THE STREET.

In a city, fragments left from loads of manure, dead fish lost by peddlers, that which people spit on the walks of the street, and so on, make dust. In the country, people sometimes throw waste from the kitchen around the back door, and this may dry and become mixed with the dust from the road, the fields, and the barnyard. You can appreciate, then, why the dust of the street is likely to be filthy.

Dust in itself might not be so harmful to health if it were not that all sorts of germs ride on dust particles, and so get into the lungs of people and into their eyes and other organs. Whatever one has on his feet when he walks on the street — shoes, boots, or rubbers — is likely to be covered with dust. If he lives in the country, and is in the barnyard, he is certain to have his boots covered with refuse which never ought to be permitted to get into a house, so that it may become dust. In some countries, the people always leave their shoes and boots outside the door. Would it be a good plan if the people did that in this country?

How can children keep well in a schoolroom like this? Schoolrooms in which children spend their time should be kept clean.

The particles are so fine that often they do not attract attention. But if one will try the following experiment, he may discover that in a room in which there does not appear to be any dust, there is really a great deal. On a sunny day, let the room be thoroughly darkened. Then cut a hole in the cloth which is used for darkening the window, in such a way that the hole will let in a ray of sunlight. If now you move around the room, and especially if you use a broom, you will probably observe a great amount of dust floating along or across the sun-

beam. The dust which you see on the sunbeam is a sample of what can be found in all parts of the room.

Dust in the schoolroom

Do you know how your schoolroom is cleaned? Have you observed whether a plan is followed which enables the one who does the cleaning to *collect* the dust, instead of spreading it around? An inspector of school buildings reported recently that in many instances he found the way the cleaning was done each day was to sweep the schoolrooms in the morning before school, without putting anything on the floors. What would you expect would follow from this method of sweeping? I know a schoolhouse in which the pupils often write their names in dust on the tops of the desks, because so much dust accumulates from the sweeping that one can make marks in it.

Dust is the home of many germs

Here is an experiment that any one may try. Take a good, medium-sized potato, wash it thoroughly, and boil it until it is cooked through, but without breaking the skin. With a clean, sharp knife, which has been boiled, divide the potato into two parts, taking care not to touch the cut surface. The reason I am asking you to be so careful is because I do not want you to get any germs on the potato from the knife or from your hands. We are going to find out whether there are germs in the dust, and we must try not to get them from any other source.

A GERM GARDEN. THE GERM SEEDS COME FROM DUST IN THE HOUSE.

Now place the two pieces of potato, with the cut side up, in the center of a soup plate, and cover immediately with a large tumbler. Then take the broom and sweep the floor, carpet, or

rug. When you have swept for half a minute, remove the tumbler covering the pieces of potato, so that they will be exposed to the air. Let them be uncovered for five or ten minutes, and then cover them again. Pour a little water into the plate, and place it in a warm place, where it will not be disturbed. In two or three days you will notice that little spots begin to appear on the white surface of the potato. These are "colonies" of germs which came from the dust. You will notice as the colonies grow that they are of different colors, — some may be red and others green or blue or yellow or brown or cream color or pearly white, and so on. The different colors are caused by different kinds of germs, just as different kinds of weeds and flowers have different colors.

This experiment may help you to understand that care must be taken to keep down the dust in one's house. The best way is to *keep dust out of the house.* This means that one must acquire habits of trying to get rid of such outdoor dust as may come into the house. Dust clings to rough, fuzzy things more than to smooth things. Silk and linen garments can be more easily freed from dust than woolen ones. Would you say that plush-covered furniture and chairs are good to catch and to hold dust? What about heavy curtains and carpets? Do you know of any house in which there is a good deal of furniture with much carving and fretwork? Would you choose such furniture for a house in which you wished to have as little dust as possible?

How to get rid of dust

I have in mind a house that was built in such a way that it is comparatively easy to keep it free from dust. For one thing, there are few angular corners. They are made round. The walls of this house are finished smooth and tinted in soft colors. This is much better than paper on the walls. The woodwork in the house is very plain, and there are no cracks in

the floor where dust may hide. The floor is made of hardwood, and you can scarcely tell where the pieces are put together. Best of all, the surface of the floor is polished so that no dust can cling to it; and if there is any dust on it, it is easily seen. The floor is not covered with carpets, but instead there are a few rugs, which are often taken out-of-doors and cleaned and

THE SUCTION SWEEPER; IT CATCHES AND RETAINS THE DUST.

aired. The chairs and tables in this house are "built on straight lines," as the furniture man says, instead of being grooved and carved.

There are cushions in this house, but they are covered with smooth instead of fuzzy cloth. The covers can easily be removed and cleaned. There are photographs and books and some bric-a-brac in this house, but they are for the most part in closed cases, so that the dust cannot settle on them. The woman to

whom this house belongs told me that all the curtains can be washed without doing them any injury. Anyone would say that this house is comfortable, convenient, and beautiful; but it is also clean, as many houses are not.

When the air is quiet in a house, the heavier particles of dust, which usually carry germs, settle on the flat surfaces in the room,

A CLEAN CITY STREET; IT IS WASHED EVERY DAY, AND SPRINKLED FOUR TIMES EACH DAY.

such as the chairs, tables, and floor. Dust settles more largely during the quiet hours of the night than at any other time. Whenever there is much moving about in a house, these particles of dust begin to whirl through the air again. The woman to whom I referred above knows very well that the best time to get rid of dust is to catch it before people begin stirring about in the morning. She gets the dust from the rug by catching it up with

a suction sweeper. She goes over the polished floors with a dust mop or a cloth placed under a long-handled brush, or with a broom covered with Turkish toweling. The dust on the furniture is removed with a dustless dust cloth. This woman takes special care not to set the dust swirling before she has a chance to gather it. When she gathers the floor dust, she puts it in a newspaper and burns it in the furnace. The dust cloths, mop and broom covers are frequently washed or boiled, and dried out-of-doors so as to keep them clean.

THE DUST ON FURNITURE SHOULD BE CAUGHT UP WITH A DUSTLESS DUST CLOTH.

Fortunately, this woman lives in a city in which the streets are kept well cleaned. Four times a day they are sprinkled, in order to prevent the dust from becoming dry enough to blow around. In this city while the people are asleep, the streets are washed clean with water taken from the hydrants. Any person who lives in a town or city where the streets are not kept clean in this way will have a hard time to keep his house clean.

There is another woman, a neighbor of mine, who knows how to keep dust out of her house. She has no suction sweeper, but before she starts to sweep the floor or the carpet, she moistens pieces of newspaper and spreads them over her carpet, because she knows that these will hold the dust and keep it

from flying about. She has carpeted steps, and she uses a damp whisk broom for these, brushing the dust from one step at a time into a dustpan covered with moist papers. She brushes each step in this order, — the riser, the angle, and the tread. She wipes the bare stairs with a dust cloth, which she makes moist by sprinkling it. When she is through cleaning, the broom and brush are shaken, washed, and kept in the sunlight until needed again.

How my neighbor dusts her stairs

This woman knows that dust is likely to settle, especially upon beds, so she puts a clean sheet over each bed at night. In the morning she lifts each of these sheets carefully, takes it out-of-doors, shakes it, and hangs it in the bright sunlight for the day. She uses this for one week, and it is then put into the wash.

You will be interested to hear that my neighbor will not permit muddy shoes and rubbers to remain in her vestibule, nor to lie on the floor of the clothes presses. Neither will she allow dusty wraps, skirts, or trousers to be hung there. She knows that beating rugs on the porch, and shaking dust cloths outside the door or window, is of little use, because the dust may be brought back into the house again with the next breeze. What my neighbor tries to do is to *catch* the dust, not to scatter it around in corners or other places in the belief that she is getting rid of it by so doing.

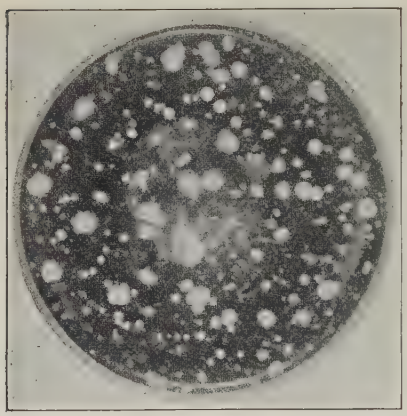
There is in this house a baby who likes to creep about on the floor. The mother knows that the floor is the place where dust settles more than anywhere else. She knows that the baby's hands, which have to be on the floor when it creeps, are likely to get into its mouth and eyes and nose very frequently. How does the mother solve this problem? She does it very easily. She pins large clean sheets over the carpets, and the baby then has a really safe playground.

How my neighbor protects her baby from dusty rugs and carpets

Have you ever seen a dust storm? In some dry countries these storms last for two or three days at a time, and they are extremely uncomfortable. If you wish to, you can make a little dust storm in your own house. You can take a broom and sweep a carpet or rug or even a floor on which considerable dust has accumulated. The broom will carry before it some large dirt particles, but it will gather almost no dust. What it really does is to spread the dust all over the room. Every stroke of the broom will start the dust flying into the air. If the sweeping be done on a carpet, some of the dust will be pushed through its meshes, and there will be an accumulation underneath, from which some particles of dust will rise into the

air every time there is a footstep or other movement on the carpet.

Some famous experiments have been made with dust. It was found that from the still air of a room before sweeping, only seventy-five bacteria settled upon a culture plate, which you know is prepared in such a way that bacteria will grow readily upon it. But immediately after the room had been swept, it was found that 2700 bacteria settled upon the plate.



A GERM GARDEN SHOWING THE GERMS COLLECTED FROM THE AIR OF A CARPETED ROOM JUST AFTER SWEEPING. THE WHITE SPOTS SHOW PATCHES OF GERMS GROWING.

REMEMBER: Bacteria travel about from place to place on dust particles, and if the dust cannot be kept out of the house, one is likely to be taking bacteria into his eyes, nostrils, mouth, and lungs constantly; and it will be a wonder if some of them do not grow and cause him pain and sickness. To prevent this, one should keep dust out of the house, and whatever gets in should be collected and destroyed. Be careful, especially, not to scatter dust around after it once settles on the floor, carpet, beds, tables, books, or furniture.

HEALTH PROBLEMS

1. What efforts are made in your neighborhood to lessen the amount of dust on walks, or the streets, or the road, or the barnyard, or wherever else refuse is ground into dust?

2. Suppose you should see a man on the street in front of your house

trying to sweep without sprinkling the street or the walk. What would you say to him?

3. Is there any officer where you live whose duty it is to see that streets and walks and roads are kept clean? Does he do his work well?

4. Are there a good many sharp corners in your school building, or are they rounded? If there are sharp corners, do you know whether the dust is always swept out of them?

5. Are the houses that you know built so as to make it easy for dust to collect, or so as to make it easy to get rid of it?

6. Are they furnished so as to make it easy to keep them clean?

7. How do the people in your neighborhood clean their houses? Find out, if you can, whether they use dustless cloths, and whether they put anything on the floor to collect the dust when they sweep.

Review Questions

1. What is the first thing to do in keeping a house clean?
2. Why may sweeping or brushing not keep dust out of the house?
3. What should one do to his shoes, boots, or rubbers as he enters the house?
4. Why is dust likely to be harmful to good health?
5. Tell about the experiment which will show that there is dust in the house.
6. Describe the kind of furniture that can easily be freed from dust.
7. Describe the kind of floors that can be kept free from dust.
8. Are rugs better than carpets for the house? Why?
9. How frequently should rugs be taken out-of-doors, and the dust beaten out of them?
10. What kind of covering is best for cushions and sofas?
11. How should dust be removed from furniture, such as tables and chairs?
12. How should beds be protected from dust?
13. How can a good, healthful play space be made for a creeping baby in the house?
14. Are the leaves of plants good dust catchers? Why?
15. How do the plants in our houses show us whether there is much dust or not?
16. How should schoolrooms be swept?

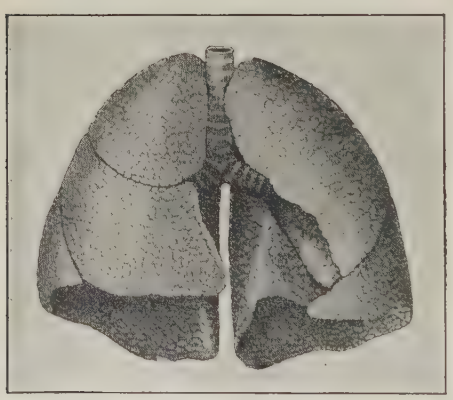
CHAPTER XIV

Health Habits in Breathing

Everything that lives must breathe. Plants breathe by means of their leaves, and fish by means of their gills, while earthworms breathe through their skins. But man has special organs designed solely for breathing. Why must every living thing breathe?

One day last spring Bertha was walking with her father along a stream, where she could hear the croaking of the frogs.

Means of breathing



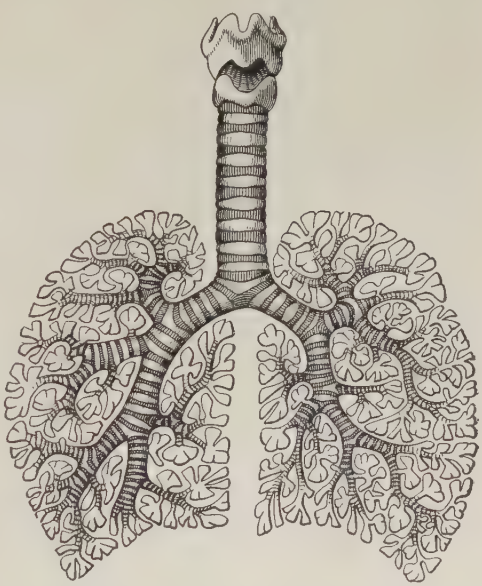
Every person has two air bags, the *lungs*, with which he breathes. Do they look like bags? Why is it proper to liken them to bags?

"Watch," said her father, as a big one came to the top of the water, "and see how he drinks air. He swallows a mouthful at a time, just as you drink water. That is the frog's way of breathing. If we could see the inside of his body, we should find there a queer-shaped bag with a tube running up to his throat. This is the frog's air bag, and when he comes to the surface he swallows enough air to fill it. Then he can dive down into the water or mud again, and stay under until his supply of air is used up."

Every person has two air bags in his body. These are called *lungs*. Our lungs need to be emptied so often, however, that we could not live very long under water.

Our air bags, the lungs

If you look on page 109, you will see that the ribs and backbone together form a case. This case is for the protection of the delicate organs which are inside. The space within is divided into two parts or *cavities* by a very strong muscle, called the *diaphragm*. The upper cavity is the *chest*, the lower is the *abdomen*. The lungs lie within the chest cavity. They appear somewhat like a sponge, being masses of tiny sacs filled with air.



THE LUNGS ARE COMPOSED OF LITTLE POCKETS — OR SACS AS THEY ARE CALLED — INTO WHICH THE AIR RUSHES WHEN WE BREATHE DEEPLY. WHAT BECOMES OF THE AIR THEN?

Air enters the body through the nostrils (opening of the nose) and passes to the lungs through a tube called the *windpipe*, which begins at the back part or root of the tongue. The windpipe divides like a tree into two main branches, then into a great many smaller ones, some not larger than a sewing needle, each of which conveys a portion of the air to one of the little sacs that make up the lungs.

One can take air into the lungs through the mouth, but this is not the best way. When air is breathed through the nose, it passes down behind the mouth through a moist, narrow canal. Here it becomes both moist and warm before passing on into the lungs. In the openings of the nose grow some stiff hairs that strain out much of the dust in the air we breathe. Finer dust and germs are caught and held by the moisture in the nose, as you can prove by blowing the nose after breathing dusty air. But when air is breathed through the mouth, it may reach the air passages and lungs cold, dry, and filled with dust; it may thus do much harm.

The right way to breathe

When going from a warm room into cold air, should one be careful to breathe through the nose? Why?

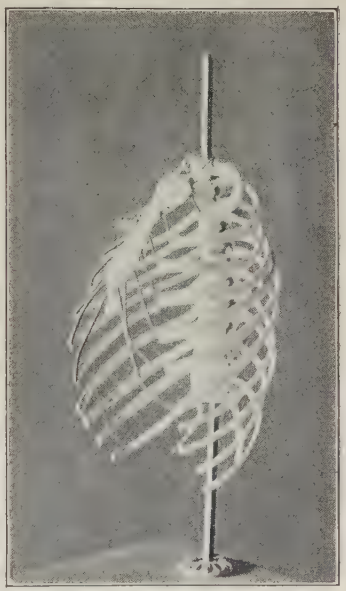
The reason why some children breathe through the mouth is because of growths that occur in the nose, which either close up the passages for air or make them so narrow that enough air cannot pass through. This trouble is a very common one. Quite recently it was found that in four hundred fifteen New York State towns, one eighth of the children were "mouth breathers." The number in other places is no doubt as great.

Some persons who know it is harmful to make a practice of breathing through the mouth, keep the jaws closed and breathe through the nose during the daytime, but at night when asleep the jaws open and unknowingly they breathe through the mouth. In the morning when they awaken the mouth is dry, the breath has a bad odor, and the voice is often hoarse. Such persons are likely to suffer from headache and a "dull" feeling.

If one keeps on breathing in this way, the shape of his mouth and nose may be changed, and the expression of his face altered.

If you have constant difficulty in breathing through your nose, you should ask your parents to take you to a physician to find the cause and to have the trouble remedied.

We require so much air all the time, and we need to have it changed so often, that nature has made our breathing apparatus so that it works a good deal like a pair of bellows. But there is this difference: in the bellows the air enters by one opening and goes out through another, while the air enters and leaves the lungs by the same route.



THE RIBS PROTECT THE LUNGS BUT PERMIT THEM TO EXPAND AND CONTRACT. SEE IF YOU CAN COUNT YOUR RIBS. SEE IF YOU CAN FEEL HOW THEY ACT.

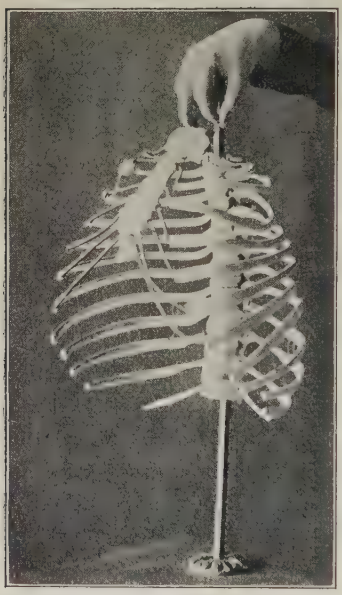
The lungs work like a bellows

The bellows action of the lungs is made possible by the *ribs* and *diaphragm*. The ribs are elastic, and each rib is connected to the adjoining one with muscles. One set of muscles draws the ribs apart, and another draws them together again. The diaphragm, which is fastened along the lower borders of the lower ribs, is shaped like a dome and rises into the chest cavity. When we start to take a deep breath, the muscles pull the ribs apart and at the same time the diaphragm flattens itself down. This causes the cavity of the chest to enlarge, and then air rushes in through the nose or mouth to fill up the space. When the muscles cease pulling, the ribs and diaphragm return to their former position, thus making the cavity of the chest small again, and forcing the air out through the nose or mouth.

This process is repeated every time one breathes. In health, we breathe eighteen or twenty times a minute. Children breathe

faster than adults. Why is this true? We breathe faster when we run than when we walk. Why?

If very tight clothing is worn about the chest, the ribs cannot stretch apart as far as they should do in breathing. Tight clothing also interferes with the action of the diaphragm, and so not enough air can be taken into the lungs. Cutting off the air supply in this way may harm the body. So you see that one should always wear his clothing loose enough to allow him to expand the chest fully with each breath.



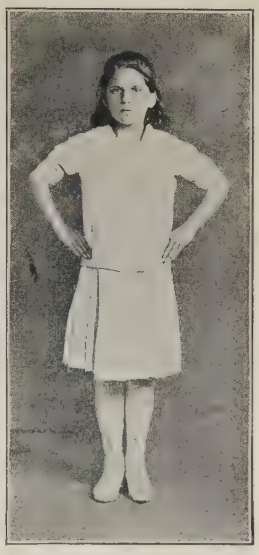
THIS IS THE WAY THE RIBS LOOK WHEN THE LUNGS ARE FILLED WITH AIR.

About two thirds of a pint of air is taken in by a grown person and the same quantity forced out each time he breathes. The lungs are large enough, however, to hold almost a gallon and a half of air. Nature has provided us with much more lung room than we ordinarily use in breathing, so that when we need to breathe much faster and deeper, as when we are climbing hills, running fast, playing ball, or otherwise exercising hard, we may have in stock enough air for our needs.

Exercise makes strong lungs

If anyone wants to have strong lungs, he must exercise them. The best way to do this is to take full, deep breaths all the time when at work or at play. We should form the habit of keeping a good posture because a bent and cramped position will prevent proper breathing. It is a good plan now and then to stop what we may be doing, to

take the following exercise: Place the hands on the hips as the girl in the picture is doing. Then bend the head backward, lift the chest as high as possible, and take in long, deep breaths, then force the air out slowly while bringing the head up again. If you feel cold at any time, several deep breath in this way will help to warm you.



"I CAN EXPAND MY CHEST FOUR INCHES WHEN I TAKE A VERY DEEP BREATH. CAN YOU DO AS WELL AS THIS?"

First aid, artificial breathing

Occasionally, when people are long under water, or are struck by lightning, they may temporarily cease to breathe. They may sometimes be made to breathe again by means of *artificial respiration*. This is one way in which it may be done: Turn the person face downward upon the ground or floor. Place a firm roll — a large folded coat will do — under his chest as shown in the picture on page 112. Then, standing astride of him with your face toward his head, place your hands one on either side over his lowest ribs. Bend your body slowly forward, then backward, pressing upon his ribs and, as you do so, lifting him slightly. Make the movement a dozen times a minute. This should be continued until he breathes, which may sometimes require a considerable period of time.

In order to be able to employ artificial respiration in an emergency, practice well the following: Have a person lie down on the floor or on a raised platform, with the face upward and the head hanging over one end. Then while standing above the person's head, take hold of both his arms below the elbows, and draw them steadily upwards above the head, holding them

in position two or three seconds; then, allowing them to go back to position, press the elbows firmly against the sides of the chest. Drawing the arms upward will cause the air to rush into the lungs, and returning them to position and pressing against the chest forces the air out of the lungs. By repeating

ARTIFICIAL RESPIRATION. — EMPTYING THE CHEST OF WATER.

this simple operation twelve to sixteen times a minute, actual breathing may be very perfectly imitated.

Try the following method and compare with the first two for ease of use: Place a person upon his back. Kneeling beside him, place one hand beneath the shoulder on the same side at which you are, and place the other hand just under the back lower down. Roll the patient over toward the opposite side until he is turned a little more than half way upon the face.

Press upon the shoulder and side of the chest in such a way as to compress it. Then roll the body back to the first position.

ARTIFICIAL RESPIRATION. — EXPANDING THE CHEST.

ARTIFICIAL RESPIRATION. — COMPRESSING THE CHEST.

It is a good plan to place a support of some sort between the shoulders. The patient's coat may be rolled up for this purpose.

Best of all is a *pulmotor*, or lung motor, by which the lungs may be filled and emptied with regularity as in life. Many lives have been saved by the prompt use of this means.

REMEMBER: Anyone who wishes to have good health must form the habit of breathing through the nose; he must wear his clothing so loose that he can fill his lungs full of air at every breath; and he must cultivate the habit of taking deep, full breaths, no matter what he may be doing.

HEALTH PROBLEMS

1. Show the class how the lungs work somewhat like a sponge.
2. Describe the movements of the ribs and chest when one breathes.
3. Do you know any persons who have the habit of breathing through the mouth? Why do they do so?
4. How can anyone form the habit of breathing through the nose during sleep as well as during waking hours?
5. Try this experiment: Tie a scarf or rope tightly about the chest. Then see if you can run as fast or as far as you can run ordinarily. Explain.
6. Walking at ordinary speed, count the number of steps you take while you draw as deep a breath as possible. Compare what you can do with what other members of the class can do.

REVIEW QUESTIONS

1. By means of what organs do human beings breathe?
2. Where is the chest?
3. How is the chest cavity formed?
4. Why are the lungs said to be like a sponge in their action?
5. How does air enter the body?
6. Why should one avoid the habit of breathing through the mouth?
7. What will happen to the shape of the mouth and chest if one breathes through the mouth all the time?
8. Why are the lungs said to work like a pair of bellows?

9. Why should one not wear tight clothing about the chest or over the diaphragm?

10. How much air is taken in at every breath? How much can the lungs hold when they are taxed to their limit?

11. What is the best way to exercise the lungs?

CHAPTER XV

Health Habits in Sleeping

You know that sleep is necessary for good health. Children and grown people who fail to get enough sound sleep soon feel ill-humored and sick.

While awake we are active most of the time. All parts of the body are busy at work. Of course, this results in much wear and loss which has to be made up somehow. Whether we are awake or asleep, the body is all the time repairing itself; but while we are active, so much body material is worn out that the mending gets far behind. So there must be regular periods when the body is quiet and in repose with all its machinery running at very low speed, if it is to catch up with its work of repair.

In sleep, the body is repaired

In the springtime when the sweet peas are beginning to grow in the flower garden, if you will measure a plant early in the morning, and again at dusk, and then again the next morning, you will find that the plant grew a good deal more during the night than it did during the day. This is true of other plants. During the daytime the plant is busy storing up food from various sources. During the night it uses this material to increase its growth.

This fact is also true of animals. Children grow during sleep more than they do when awake. Sleep is thus the best time for growth and repair of the body.

Healthful sleep is sound and dreamless. After a night of such sleep, one awakes feeling fresh, rested, and brimful of good

spirits. He is ready then to undertake any task. Even the things that looked hard the night before seem easier after a good night's rest. Give instances in your own life to illustrate this.

The best time for sleep is during the darkness of the night. Why should this be so?

The old maxim "early to bed and early to rise" indicates an important health habit. Going to bed late and getting up late is by no means so good a habit. Every one must have a certain amount of sleep. The amount of sleep we need depends upon our age and health. The younger one is, the more sleep he requires. Persons in ill health need more sleep than those who are well. The following program for people of different ages is a good one:

How much sleep do we need?

From four to seven years of age, twelve hours of sleep.

From seven to nine years, eleven hours.

From nine to twelve years, ten hours.

From twelve to sixteen years, at least nine hours.

Grown people require from seven to eight hours of sleep.

To go to bed at a regular time each night is a most important health habit. If one forms the practice of going to bed one night at one hour and another night at another hour, he will soon find it difficult to drop off to sleep at once. If one continues such an irregular plan, he is likely to lose much needed sleep, and illness may result. One cannot keep in health without his full requirement of sleep. What is the number of hours which you need to sleep to feel and keep well? At what hour ought you to go to bed to get your full sleep and arise early enough to be ready for school on time?

Regular habits in sleep

In the morning, when sleep is ended, we should arise promptly. To lie in bed and doze, half asleep, is a bad habit.

Most persons sleep soundly when they are somewhat tired. Why is this? A very wise man once said: "The sleep of the laboring man is sweet." Have you observed that those who are active during the day sleep better at night than those who lounge about and spend the daytime in idleness? Why should work and exercise lead to sound sleep? One should not, however, play very hard or engage in exciting games just at bedtime, as this is likely to arouse one so that it will not be easy to get to sleep. The same is true of reading or listening to exciting tales near bedtime.

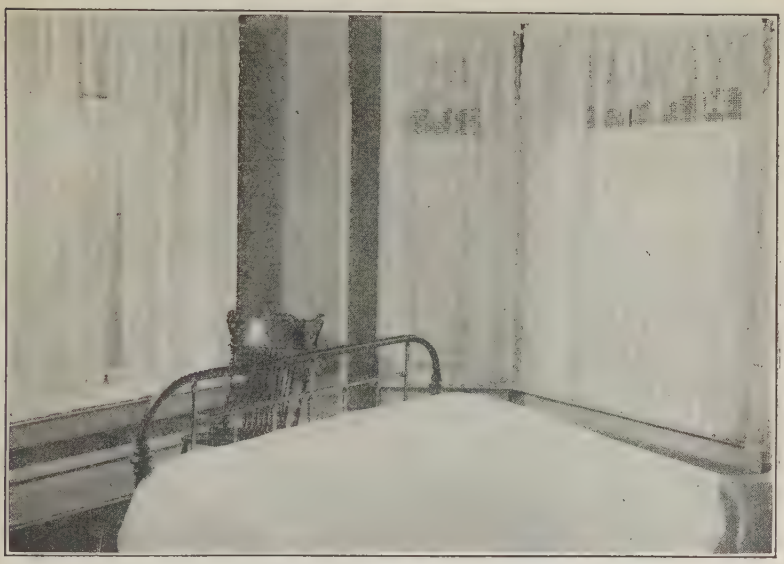
Perhaps you have noticed that people who eat hearty suppers late at night are likely to sleep poorly and to have bad dreams. Those who use tea, coffee, or cocoa at supper are likely to be wakeful at night, for these drinks arouse one, or make one sleepless. Many people are wakeful if they drink coffee, tea, or cocoa at any time during the day. These drinks are also harmful in other ways.

Fresh air

One sleeps best when breathing pure, fresh air. To sleep in the open air is most restful. If one cannot sleep out-of-doors, he at least should get plenty of outdoor air into his sleeping room at all seasons. About one third of one's whole life is spent in sleep. Not to have good air to breathe during so much of life may shorten it considerably. Besides, for the body to do its work of repair during sleep in a perfect manner, it needs the help of pure air. If one sleeps in a close, warm room, the body will be unable to obtain this help, and so its work cannot be well done, and one may awake in the morning feeling dull, tired, and cross, and perhaps with a headache. You will remember that in a previous chapter we saw how one can get an abundance of fresh air at night. You should try this plan if possible.

The bed should not be too soft. The old-fashioned feather

bed has been justly discarded because it was too soft and tended to overheat the body. It was bad for other reasons, especially because of the difficulty of keeping it sweet and clean. Mattresses made of hair, cotton, wool, moss, or excelsior are healthful and comfortable.



THIS BEDROOM HAS LARGE WINDOWS ON TWO SIDES, SO THAT PLENTY OF FRESH AIR CIRCULATES THROUGH IT WHEN THE WINDOWS ARE OPENED WIDE.

Many people think a pillow is not needed. If one be used, it should be rather firm and not thick; just high enough to bring the head on a level with the body. It should never be high enough to elevate the shoulders. The real use of a pillow is to support the head. The Japanese maiden who sleeps with a notched block of wood and a tiny cushion placed under the neck has a better support than the big, fluffy cushions we use for pillows. The use of pillows

The question of the pillow

while we sleep is a common cause of round shoulders. You will remember that when one is young the bones easily become crooked. To lie every night with the head too high cramps the chest and may even change the shape of the shoulders.

THE JAPANESE MAIDEN HAS A NOTCHED BLOCK OF WOOD AND A TINY CUSHION FOR A PILLOW, WHILE WE OFTEN HAVE VERY BIG, FLUFFY CUSHIONS.

For healthful sleep

The most restful and healthful way to lie for sleep is with the body stretched out at full length, with the spine in a straight position.

The body must always be comfortably warm during sleep. One cannot sleep soundly if one feels cold. Even if the feet only are cold at bedtime, this discomfort may keep one awake. If at bedtime one's feet are cold, he should warm them well. A

good way is to put the feet in hot water for five minutes, then dash a dipperful of cold water over them, and wipe them dry by rubbing them hard with a rough towel.

The best way to cover oneself while asleep is with soft, fleecy blankets, warm but of light weight. All bed clothing, like all body clothing, should be porous; that is, it should allow air to pass through it. When we sleep, as when we are awake, waste

WHAT WILL HAPPEN TO THIS GIRL IF SHE CONTINUES TO LIE IN THIS POSITION?

and perspiration are being thrown off by the skin. If the air cannot get through to cleanse them, the bed blankets will soon be filled with this waste. Under such coverings, sleep is likely to be restless.

Comforts and quilts filled with cotton make warm coverings, but they are not so healthful as blankets. Can you think why?

Clean beds are necessary for health. My neighbor Janie has been told this so often that she has formed an excellent

health habit. Every morning when she is dressed she places two chairs at the foot of her bed. Then she takes off the covers one by one and throws them loosely over the chairs. She begins with the top one, and always takes pains that none of them fall on the floor to get soiled. Then she places the pillows on another chair. This done, she opens wide her windows, shuts the door, and leaves the bedding for the fresh air to cleanse while she goes to breakfast. Each week, on the day when the bed linen is changed, she carries her blankets out-of-doors and hangs them on the clothesline in the bright sunlight for a few hours to make them fresh and sweet. I need hardly tell you that Janie sleeps more soundly because of the good care she gives to her bed.

Health Problems

1. Why does one feel rested after a night of sound sleep? What has taken place in the body during sleep?
2. Do you ever lie awake in your bed at night wishing you could go to sleep? If you do, think over what you did for several hours before bedtime, and see if you can find the cause of your sleeplessness. Did you drink tea, coffee, or cocoa?
3. Why do those who live in the city like to go out in the country and sleep in a tent or under the open sky?
4. Can one sleep as soundly when lying on the back as when lying on the right side?
5. Can one sleep soundly with knees drawn up toward the chest, and with one hand under the head?

Review Questions

1. Why is sound sleep necessary for good health?
2. When does the repair of the body go on most actively?
3. When is the best time for sleep?
4. Give the rule for the amount of sleep we should have at different ages.
5. Does a person need more sleep when he is ill than when he is well? Why?

6. Should one go to bed at a regular hour every night? Why?
7. What habits may make one sleepless?
8. Should one have fresh air while sleeping? Why?
9. How should one lie while sleeping?
10. How should one's bed be arranged for the most healthful sleep?
11. How should the bed be cared for in the morning?

CHAPTER XVI

Health Habits in Eating

Wood, glass, steel, and other materials are needed to build a house or a ship. So certain materials are needed to build our bodies. This building material we obtain chiefly from our food. Our bodies are made up of what we eat. If one eats poor food, he will not grow properly, and he may become ill, or feel half sick all the time. Wrong habits of eating are the cause of more sickness than any other one thing. To keep well, and to accomplish the most, we must choose good foods and eat them properly.

Building material for the body

Our bodies are in some respects like machines. For one thing, they are always wearing out, and needing to be repaired. So material is required for repairs in the body, as well as for building. How does a locomotive obtain the energy which enables it to pull a train? How does the body get the energy which it needs for work and play? If you put your hand into cold water, it will soon become cold, but when it is removed it quickly becomes warm again. This is because the food we eat is burned in the body, and in this way we are kept warm. Food is fuel.

The body resembles an engine

Food supplies five needs of the body:

1. *Building material.*
2. *Energy*, or power for play or work.
3. *Heat*, to warm the body.
4. *Vitamines*, to aid growth and repair and maintain health.

5. *Roughage*, in the form of *cellulose*, to aid in carrying away unusable substances and refuse.

Very few foods contain just the right amount of each kind of food material. Some foods, such as eggs, beans, cheese, and meat, contain building material principally, while others, such as butter and sugar, are composed wholly of energy and heat-making material. We, therefore, need to eat a variety of articles, such as bread, butter, milk, eggs, vegetables, and fruits, in order that the body builders may be able to get plenty of each kind of material needed.

The types of food material

It is highly important that the bill of fare should be properly balanced; that is, that it should contain the proper amount of each food element, to make good the daily losses of the body, and to provide the necessary heat and energy, and a sufficient amount of cellulose or roughage to enable the body promptly to dispose of its wastes.

Children need more food in proportion to their size than do grown people, because their bodies are being built. They need material for making bones and muscles, and for all the growing organs. Still, children very often overeat.

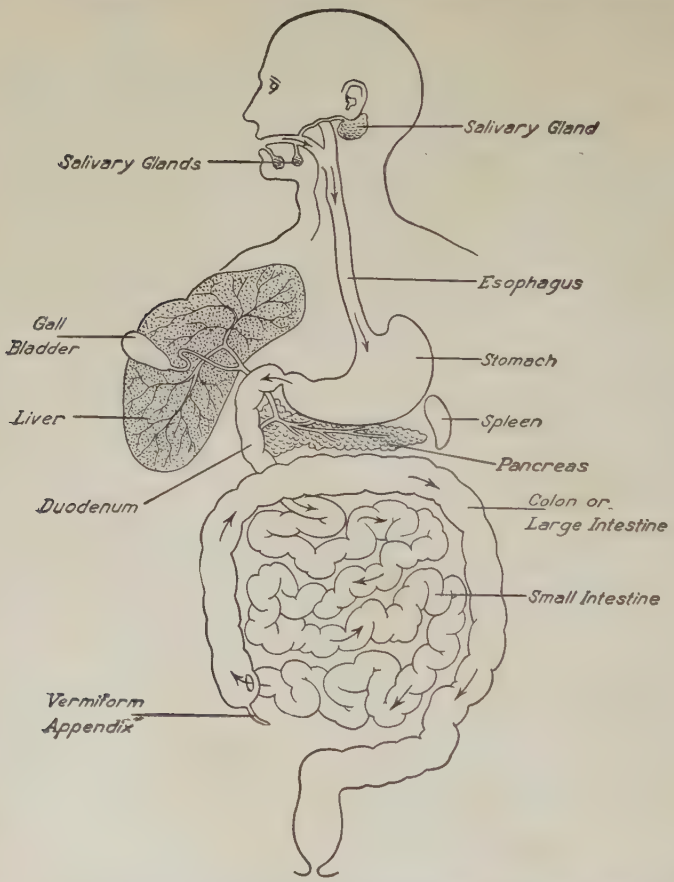
In converting food into muscles, bone, and other tissues, we ourselves can do but little. We can put it into our mouths, grind it with our teeth, and swallow it. The body must do all the rest. But we can help or hinder the work in many ways.

One way in which people often hinder the body's work is by *eating too fast*. Food as it is put into the mouth is not in condition to be used by the body. All of it has to be dissolved and made into a liquid form before it can be used in the body. The process by which this is done is called *digestion*.

The work of digestion

The organ in which this work is carried on is a long tube, or food *canal* as it is called, beginning with the mouth. If laid out

straight and measured, this canal would be about thirty feet long. In some parts it is narrow, while in other places it is



THIS FOOD CANAL DOES MORE REMARKABLE WORK THAN DOES ANY OTHER KIND OF CANAL YOU EVER HEARD OF. NOTE THE VARIOUS LABORATORIES.

much wider. Some parts of the tube are straight, other parts are coiled. At different points along the canal are laboratories,

in each of which some special work is done until all material that is good for the body's use has been culled out of the food and sent into the blood.

There are five food laboratories, the *mouth*, the *stomach*, the *small intestine*, the *liver*, and the *colon*. Each of these laboratories does something special to the food. **Five food laboratories**

The mouth laboratory contains a mill for grinding the food, by chewing it. Close by the mouth are *salivary glands* which produce *saliva;* this moistens and dissolves the food and converts the starch into sugar. You must have noticed that a crust of bread becomes sweeter the longer it is chewed. **1. The mouth laboratory**

The longer the food is chewed, the more saliva will be mixed with it and the more sugar will be produced. The saliva acts upon the food not only while it is in the mouth but also for about an hour after it has been swallowed.

When food is well chewed, the organs of taste can do their work thoroughly, and taste thus enables us to make a good selection of foodstuffs and to determine the quantity of food we need, as well as to judge of its quality.

If the food is not well chewed, the work of the stomach laboratory is disturbed.

Have you ever suffered from a *sour* stomach? If so, it was probably due to the fact that you did not chew your food sufficiently.

In the stomach laboratory there is an acid juice which begins the work of digesting the *albumens* (white of egg, lean meat, brans, cheese, and the like); but the work is not completed here. The stomach only prepares the food for the more complete digestion effected in the small intestine. **2. The stomach laboratory**

The stomach, then, may be compared to a kitchen in which food is made ready to serve in the dining room.

The small intestine is the great food laboratory of the body. It might be called the dining room of the body, for here the digestion of the food is completed. Here also are about five million *villi*, which extend into the food mass in the intestine like short hairs and absorb the digested foodstuffs. Each of the villi absorbs about two tablespoonfuls of liquid in a lifetime of sixty years. They are like the rootlets of a tree. They suck up the liquid nourishment provided by the digested foodstuffs, which may be compared to the soil that surrounds the roots of a plant.

3. The chief food laboratory

In the small intestine the food is acted upon by the *bile* from the liver, the *pancreatic juice* from the *pancreas*, and the *intestinal juice*, which together digest all the substances found in our natural foodstuffs.

In the liver laboratory the work of preparing the food for use is completed. The liver does so many things to the food that one cannot mention them all. Besides aiding in the digestion and use of all the different food elements, the liver laboratory destroys poisons or makes them incapable of producing deadly effects by taking away from them their poisonous qualities.

4. The liver laboratory

Every large city has a waste plant where all kinds of refuse are received and burned or otherwise disposed of. The colon or large intestine is the waste-disposal system of the body.

5. The refuse laboratory

The food leaves the stomach about four hours after it is eaten. In four hours more digestion and absorption are finished and the unusable remainder has reached the middle of the colon. The food has traveled twenty-four feet in eight hours. How many feet, then, does

6. The digestive time-table

the food travel per hour in passing from the mouth to the middle of the colon?

The remaining distance to the end of the food tube is three feet. At the same rate, how long a time should the food require to travel this short distance?

The X-ray shows that the useless food substances left after digestion, instead of being dismissed from the body within two or three hours, sometimes require fifty hours or more, which is harmful to health.

When the waste substances are thus held for many hours in the colon, they begin to decay. Foul odors and poisons are formed, and these harmful and offensive materials may be absorbed into the blood and produce general poisoning, or *auto-intoxication*. This is the most common cause of headache, a "coated" tongue, an offensive breath, loss of appetite, a bad complexion, and many other unpleasant and painful conditions.

How the body becomes poisoned

Do you ever have a headache?

Is your tongue ever coated and your breath unpleasant?

The colon ought to be cleared of refuse at least once every day. When food is eaten, all the laboratories are set to work; the colon, like other parts of the canal, feels the stimulation of the eating process, and as a result there should be a natural discharge of wastes. In other words, the bowels in a healthy person should move regularly. If they do not, more roughage is needed in the shape of "greens," or bran, coarse vegetables, and whole grain foods such as oatmeal. The hardy Scotch Highlanders live largely on "brose," which is oatmeal cooked only eight or ten minutes, an excellent food for bones and muscles, and likewise a good tonic for the bowels. Sometimes lubrication is needed. Then a large spoonful of mineral oil may be taken at each meal.

The study of the food tube or canal after a test meal by means of the X-ray has shown that the food does not move along the canal at a regular rate, but by stages, making long or short pauses at various points. These pauses are controlled by "gates," which hold the food at various points as it is moved from one laboratory to another, while the different kinds of work needed in digestion are being completed one after another.

The ten gates

Let us now learn about these ten gates.

The mouth admits the food, and so may be called the food dictator. We are responsible for our food while it is in the mouth and for the selection of our food. After food is swallowed, we have no control of it, so we should take care to put nothing in the mouth which can harm us in any way. And we should take good care of our mouths so that clean food will not be soiled by contact with an unclean mouth.

1. The food dictator's gate

2. The inspector's gate

The *soft palate* and the folds at the back of the throat inspect the food to find whether it has been properly chewed and is otherwise suitable to be swallowed.

3. The food and water gate

The upper end of the food tube, the *gullet* or *esophagus*, is closed except when food or drink is being swallowed. Just in front of this is the air-gate which leads to the lungs.

4. The stomach gate

At the lower end of the gullet, where it joins the stomach, is a muscular ring which guards the entrance to the stomach. This gate opens when food is being swallowed, but is closed at other times.

5. The bowel gate

The bowel gate is closed during digestion, opening at short intervals to permit the partially digested food to pass into the intestine in small quantities.

When the stomach is empty, strong contractions occur which

produce the sensation of hunger. Very violent contractions give rise to pain.

A muscular ring at the lower end of the small intestine holds back the food until digestion and absorption are practically complete. This gate then opens at intervals to allow the food remains to pass through into the colon.

6. The control gate

This gate is a check valve which prevents the substances that have entered the colon from passing back into the small intestine. When the colon is allowed to become loaded with refuse, this valve may be unable to act, and the waste matters of the colon may pass back into the small intestine.

7. The colon gate

At about the middle of the colon, movements called *peristaltic waves* pass in both directions — back toward the entrance and forward toward the exit. This arrangement prevents the immediate discharge of the liquid material from the small intestine. The contents of the intestine become concentrated and are then pushed along toward the exit.

8. The reversing valve

The next gate consists of a loop of colon which receives the waste substances and, when they have accumulated in sufficient amount, discharges them. When this loop of the intestine is empty, it falls down low in the cavity of the trunk. As it fills, it gradually rises and on reaching a certain point discharges its contents. This ought to occur at least once each day.

9. The discharging gate

The last gate is always closed except when open to permit the discharge of waste matter.

10. The exit gate

There is such a wonderful unity between the different laboratories and gates of the food tube that when work begins in one laboratory, all the rest prepare for work, and when there is a stoppage at one gate, the gates above, or leading to it,

close tightly so as to prevent increase of trouble at the obstructed gate.

How the digestive machinery works together

When people suffer from indigestion, it is because there is disorder or trouble in some one or more of the laboratories or at one or more of the gates.

Did you ever have indigestion? In which laboratory was the trouble, do you think? Which gate refused to close or to open?

Did you ever vomit? Do you think the food would come up from the stomach if the bowel gate were open so that food could pass down?

Here is a table which shows the time required in a healthy person for an ordinary meal to pass through all the gates and the whole length of the food tube:

THE DIGESTIVE TIME-TABLE

	BREAKFAST
Mouth	8:00 A.M.
Stomach, empty	12:00 NOON
Small intestine, empty	4:00 P.M.
Colon, waste matter ready to be discharged	10:00 P.M.

The taste of food in the mouth is a signal to the stomach to get ready to digest the food that is coming. In turn the word is passed along to every laboratory until all are in readiness for service.

When a person eats very fast, the food is swallowed before it can be crushed into fine pieces, and then the laboratories along the food canal have a hard time dissolving it.

Health rules in eating

Try this experiment. Take two glasses of water. Put a few hard lumps of sugar in one, and a spoonful of fine sugar in the other. Which dissolves first? What you find true of the sugar is true of our food. The finer the par-

ticles into which food is divided before it is swallowed, the more readily it is digested.

One way, then, in which we can help the body in its work is to *eat slowly*, and to chew every morsel of food until it is fine before swallowing it. **1. Eat slowly**

Some experiments that have been tried have proved that two thirds of a pound of food well chewed will supply the needs of the body as well as a whole pound of the same food when chewed too rapidly. What is the reason?

IS IT A GOOD HEALTH HABIT TO WASH DOWN FOOD BEFORE IT IS CHEWED?

Did you ever look at your tongue in a mirror? If so, you must have noticed that its surface is covered with little points, some of them larger than others. These points are sometimes called *taste buds*, because it is by means of them that we are able to taste the different flavors in food and other substances that we put into our mouths. One curious fact about these taste buds is that those which give sweet tastes are on the tip of the tongue. Buds for other tastes are located on the side of the tongue, while we taste bitter substances on the back of the tongue. If our tongues are coated and furred,

the taste buds do not work well, and our food seems to have no taste, so that we do not enjoy eating. These taste buds were meant to give us pleasure while we eat. But if we hurry through our meals, swallowing our food almost as soon as we get it in our mouths, we miss most of the taste, and spoil Nature's plan for our pleasure, beside doing ourselves an injury.

DID YOU KNOW THAT ALL TASTES AND FLAVORS DEPEND UPON THE ACTION OF "BUDS" ON THE TONGUE? NOTE WHERE THE "BUDS" FOR THE DIFFERENT TASTES ARE LOCATED.

When people eat fast they are very likely to eat *too much.* The laboratories of the food canal are able to do only a certain amount of work. When too much food is eaten, not any of it can be as well digested as it ought to be. If food is not well digested, then, of course, it does not make good material for building or warming the body, or keeping it fit for play or work.

Do you think one should ever eat until he feels *stuffed?* How much one ought to eat depends upon his size, his age, the work he does, the weather, whether he lives indoors or outdoors, whether he is active or idle, and upon other conditions.

2. Eat regularly

Three meals each day are quite enough for boys and girls who are in good health. These ought to be eaten *regularly;* that is, at the same hour every day. If we eat our breakfast every morning at seven o'clock, and our dinner each day at one o'clock, the body is on the lookout for food at those hours, and has everything all ready in the stomach to receive it and make use of it. If, however, one gets so interested in his play that he comes to dinner an

hour or two later than usual, then when he swallows his food the stomach is taken by surprise. If one is careless and eats his meals at different hours each day, he is likely to upset Nature's orderly plan, and illness may follow.

When children wait to take extra naps after they have been called in the morning, it often happens that they have time only to eat a few mouthfuls hastily before going to school. This, too, interferes with Nature's plan. It is very likely that not enough food is eaten, or that it is swallowed without giving the taste organs time to do their work thoroughly, and that therefore the body does not have enough material for all its needs.

You know your food is used to make blood, and that the food has to be ground into pieces and changed a great deal before it is ready for use. After you have eaten a meal, it takes the stomach four or five hours to care for the food. Sometimes it takes even longer, according to the things you have eaten, for it is a good deal harder to digest some foods than others. Do you know what foods you can digest most quickly? What foods require a long time to digest?

3. Give the digestive organs rest

If we eat anything an hour or two after breakfast, when the work of changing the food is well under way, the workers, instead of being able to keep on working until their part in digesting the breakfast is finished, have to begin again at the very beginning of the process of digesting the new food that has been eaten. So it may happen that the breakfast material is kept in the stomach much longer than it should be, and too much acid is developed, causing a sour stomach.

If you have eaten too little food at a meal, and feel hungry before the next meal, you may eat an apple or an orange or some other simple fruit; but cookies, candy, bread and butter, and similar foods should be avoided. Fruits, if ripe and if well

chewed, give the stomach very little work to do, because they are already cooked and digested in the sun, and contain foodstuffs ready for the body to use; for this reason fruits do not tax the digestive organs heavily.

When the stomach is abused, it becomes unable to digest, and then we *lose appetite.* Pain in the stomach, vomiting, and sick headache are some of the ways in which the stomach complains when it has been abused. We never feel the working of a healthy stomach.

4. Also rest at night

The stomach, besides needing rest after each meal, needs also to rest at night while we sleep. Hence we should avoid eating food late at night. If one goes to bed with a stomach full of food, the stomach will act very lazily, just as people work very slowly when they are sleepy. Besides, one's sleep is likely to be much disturbed by dreams and one may awake in the morning without feeling refreshed.

Recent studies of digestion have shown that the stomach needs to become completely empty for a little time before each meal to enable it to become disinfected and to get ready for the next meal.

5. Rest before eating

Again, the food workers cannot serve us well when the body is very tired. When we have been exercising very hard at work or play, we should rest for a little while before eating. Why is this a good health habit?

6. Secure variety.

It is best to avoid eating too many different kinds of food at one meal. The food workers can take care of three or four different foods easier than they can a dozen kinds. We need to eat a wide variety of foods, but it is better to have this variety from day to day than to have it all at one meal.

A wise man once said, "We should eat to live, not live to eat." Do you think that everyone should learn to choose

SWEETS

Constant indulgence in sweets
(especially between meals)
Impairs the appetite
Ruins the digestion
Decays the teeth
Lays the foundation for sickness in later life

Tommy had a tummy which he stuffed with lollipops,
Chocolate and soda, taffy and gum-drops.
Tommy has dyspepsia now, Bright's Disease and gout,
"And the Gobble-uns 'll git you, ef you don't watch out!"

Said dapper Mr. Date to dried but sweet Miss Fig,
"Why is it Master Sammy is so healthy and so big?"
Said she "Upon cheap goodies, he never spends his money;
He loves raisins, figs and dates, maple sugar and pure honey."

foods that nourish the body, rather than such as merely please the taste? Why? Sometimes children injure their health greatly by eating only the pie or pudding and other relishes on the table, leaving the bread and butter, potato, and other important foods untouched.

7. Eat nourishing food

Some parts of the food we eat cannot be digested. Some indigestible material is necessary to serve as roughage. After the food laboratories have sorted out and taken care of all that is usable, the waste that remains must be expelled from the body. If this is not done promptly, the waste material undergoes decay and becomes a poison to the body, and may be the cause of serious disease. The "call of Nature" to clear the colon of waste matter should always receive prompt attention at least once each day. This is a health habit of the utmost importance.

There are very degraded tribes of human beings living in certain parts of South America who consume considerable quantities of clay, eating lumps of it as you and I eat bread.

Do you think that clay is of any benefit to them?

Certainly not. They are greatly injured by it. Some children form the habit of eating chalk, slate pencils, and similar indigestible things. This is a very bad habit, indeed. It is about as bad a habit to eat mustard, pepper, pepper sauce, horseradish, and spiced pickles. These condiments have no more food value than clay, and they are even much worse because they contain irritating oils which are highly injurious and they damage the delicate organs with which they come in contact. For this reason, condiments and hot sauces of all sorts are usually harmful. They not only injure the stomach, but they also damage the liver and kidneys and tend to cause hardening of the arteries and other ills.

It is highly important that the foodstuffs should be carefully

chosen. One should not choose in a haphazard way, eating any food that comes along or any kind that may be presented to him. We should remember that our bodies are made of what we eat. If we wish to have strong and healthy bodies, we must take good care to secure the best building material.

Food should be chosen carefully

With reference to the quality of the food, a few points are particularly important:

1. Most of our foods come from the vegetable kingdom, the original source of all food. The animals feed upon plants directly, or indirectly by eating other animals which have been nourished by plants.

Recent experiments have shown that it is necessary, as a rule, to make use of all parts of food plants in order to secure all the substances necessary for building our bodies and keeping them in health. Animals which feed upon seeds only soon show evidence of ill health. The same is true when roots are made the exclusive diet. Seeds, roots, and green leaves or tender shoots all must be eaten to furnish everything needful, and for safety milk should be added. Green leaves, and such articles as celery, lettuce, and the like are highly essential foods. Spinach or some other greens should be eaten daily in liberal amounts.

We must eat all parts of food plants

Some animals are so organized that they can live exclusively on meat. This is true of certain carnivorous animals. It is noticeable, however, that these animals do not thrive upon meat alone, or only upon the soft parts of animals. They must eat the bones as well, for bones contain *lime*, which is necessary for keeping in health not only the bones but also the fleshy parts of the body. The muscles do not work well without lime; the heart becomes feeble, and the blood also suffers loss. Hence, the bones must be eaten

Meat-eating animals

along with the soft parts. In other words, the whole animal must be consumed to make nutrition complete. We cannot do this because we are not naturally adapted to such a diet. Some persons who eat largely of meat are much injured by so doing. In eating meat we are likely to get more protein than we need. The excess is a burden to the body. Some portion undergoes decay in the colon, thus causing poisoning of the whole body. When one eats much meat, the work of the kidneys is doubled because they must remove the poisons from the blood. It is for this reason that doctors forbid the use of meat to patients suffering from diseased kidneys. Do you not think it a wise thing to begin to take care of the kidneys while they are healthy, so as to keep them from becoming diseased?

2. Every child should have a quart of milk daily; if he has this amount he does not need meat, and is usually better off without it.

Man is not naturally a flesh-eating animal, but belongs to the fruit-eating and vegetable-eating animals along with the orang-utan, chimpanzee, and gorilla.

The diet to which his digestive organs are best adapted consists of nuts, fruits, grains, tender shoots, and juicy roots, with milk and eggs.

3. Physiologists have shown that human beings cannot thrive upon a diet consisting mainly of foods like lean meat, beans, cheese, or other proteins, with butter, cream, or other fats. A suitable amount of starch foods, like white bread or potatoes, is absolutely necessary. For the best health a *balanced* bill of fare is essential. Such a bill of fare consists of about ten per cent *protein*, which we get chiefly from bread, beans, peas, milk, meat, eggs, and cheese; thirty per cent fat; and sixty per cent starch.

We must have a balanced bill of fare

Professors Chittenden and Mendel, of Yale University, many years ago demonstrated that such a bill of fare is better adapted to the advancement of health and vigor than one containing a large amount of protein. The experiments of these investigators plainly showed that the amount of protein actually required by the body is much less than that usually eaten.

In selecting a meal, it is important to give careful attention to the quality of the material furnished by the different articles of which the bill of fare is composed. The amount of starch found in different foods differs greatly. For example, lean meat contains no starch; rice, on the contrary, contains almost nothing else. Butter is nearly all fat. Olive oil is pure fat.

REMEMBER: Anyone who wants to get the most out of life must eat slowly and chew his food thoroughly, so that he may enjoy its taste completely, and prepare it fully for the laboratories farther down in the food canal. He must give these laboratories time to rest. He must not eat between meals. He must have his meals regularly. He must not make a meal of cake or pie alone, just because he likes it. He must not eat until he feels stuffed. He must not eat when he is very tired. He must not wash his food down with drink. He must not eat highly seasoned food. He must eat sufficient bran, greens, fresh fruits, and vegetables to cause the bowels to move freely. He must not eat meat to excess, but must make eggs, milk, grains, and vegetables the chief part of his bill of fare.

HEALTH PROBLEMS

1. How do you know that the food you eat is made into bones, muscles, hair, skin, lungs, and other organs? Be ready to tell the class some way to prove this.
2. How can you tell that the food you eat warms your body?
3. How can you tell that the food you eat gives you energy?

4. How long does it take you to eat your breakfast? Your luncheon? Your dinner? Is this long enough to get all your food into proper condition before it is swallowed?

5. Who enjoys his food the more while he is eating it, the person who swallows it unchewed, or the one who chews it thoroughly? Explain.

6. Why does nothing taste good when one has a coated tongue? What do you think Nature intended that one should do when he has a coated tongue?

7. Will it be better for one's health if he talks about pleasant things at the table, than if he talks about disagreeable things, or if he gets angry? Why?

Review Questions

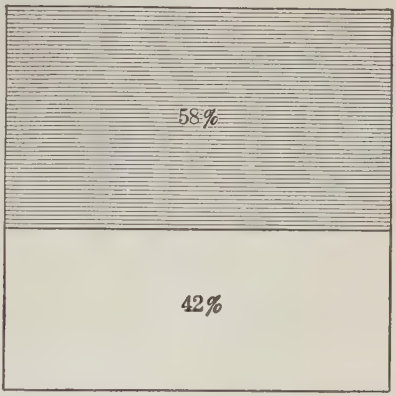
1. From what do we obtain the materials with which to build and repair the body?
2. From what do we get the energy we need in play and in work?
3. From what do we get the heat with which the body is warmed?
4. Why do we need to eat a variety of foods?
5. What is meant by the term *digestion?*
6. Where is the *stomach?* What is its work?
7. What are the food workers in the body?
8. Why is it necessary to chew food thoroughly?
9. What are the *taste buds?* Where are they located?
10. How often should one eat during the day?
11. Why should one not eat candy, cake, and such sweet foods between meals?
12. Why do the food workers need to have rest?
13. Is it well to eat heartily immediately after hard work or play? Why?

CHAPTER XVII

Health Habits in Drinking

If you wet your handkerchief in water and lay it aside in the open air, you will find that after a time it has become dry.

When you sit for a time in a close, hot room, your lips become parched, and your skin feels dry. The heat has made the air thirsty, and the air is trying to get moisture from your body.



More than one half the body is water. The shaded part of the picture shows the proportion.

The need of the body for water

Although the body is more than half water, it is all the time losing moisture so rapidly that one needs to drink often to make good its losses. The body needs water also to supply the fluids which digest the food we eat. Some of the fluids of the body help to carry the digested food where it is needed. Another need for water is to dissolve and wash out of the body through the perspiration and by other means the waste products that are continually forming. These waste matters are poisonous; if they are not expelled from the body promptly, illness will result.

The body shows its need for drink by a "dry" or thirsty feeling, just as it shows when it needs food by the feeling of hunger.

The best drink is pure water. Water is, in fact, the only substance which will quench thirst. That other drinks afford relief from thirst is due to the water they contain.

Fruit juices, orangeade, and lemonade are flavored water. These are wholesome drinks. Tea, coffee, wine, cider, and beer are also largely composed of water; but the last three contain harmful substances, and should never be taken. Even tea and coffee often cause injury when habitually used.

Most people do not drink enough water. It is rare that one drinks too much water. Many people drink a great deal of tea, coffee, and such liquids, but not enough of pure water. Tea and coffee both contain in small quantities a substance known as *caffeine*, which when undiluted is so poisonous that it takes but a very small amount to kill a rabbit.

Pure water the necessary drink

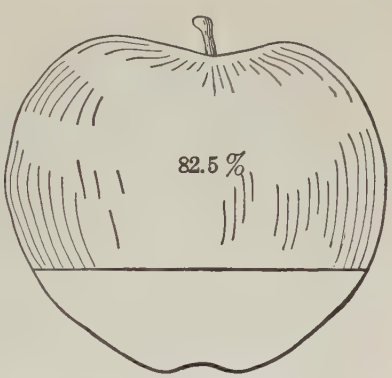
Caffeine affects the brain and nerves, often causing sleeplessness and nervousness. Tea and coffee are not foods like milk; they are only stimulants. They sometimes cause indigestion and harm the body in other ways. Cola drinks, which contain caffeine, are often injurious for the same reasons. Those who wish to preserve their good health should not form tea, coffee, or cola habits.

A grown person needs from four to five pints (8 to 10 glassfuls) of water every day. A half-grown boy or girl needs about the same amount. Just how much of this he must drink depends upon the kind of food he eats.

Much pure water is stored away in fruits and green foods; and those who make free use of these get in this way a large part of the water their bodies need.

People who eat a great deal of meat and hardly any fruit need to drink much more water. Why?

Meat is not the best food for most persons, and we can easily do without it if we eat plenty of milk, eggs, and greens. Milk is much more wholesome, and meat contains nothing which milk and other foods do not supply in palatable form. A quart of milk contains as much nourishment as a pound of fish, and of better quality. When milk is used in generous quantity at all meals, it is not necessary to drink so much water as when much meat or fish is eaten.



PEOPLE WHO EAT MUCH FRESH FRUIT DO NOT NEED TO DRINK SO MUCH WATER AS THOSE WHO EAT BUT LITTLE FRUIT. YOU SEE FROM THE SHADED SECTION THAT OVER THREE-FOURTHS OF AN APPLE IS WATER.

All meats contain waste substances like those of our own bodies, and for this reason they increase the work of the organs that get rid of wastes, like the liver and kidneys. For this reason more water must be taken when meat is eaten.

While we should drink freely of water, it is better to form the habit of taking small quantities often, rather than a large quantity at one time. Usually a person should not drink more than one glassful at a time.

Good habits in drinking

If the water is very cold, it should be taken in small sips. Hold each sip in the mouth until it is warmed before swallowing. This should be done with any very cold drink or food. Why?

When one drinks water during a meal, it should be taken only after the food in the mouth has been swallowed. If food is half chewed and washed down with drinks of any sort, it will

not have so good a chance of being digested as when it is thoroughly chewed and moistened by the juices in the mouth.

We should drink only *pure* water. The fact that water is cool, clear, and sparkling is not a sure sign that it is pure. We must know its source in order to determine whether it is safe to drink. A pleasant taste and appearance are not sufficient. Why can we not always detect impure water by its taste or its appearance?

Water which comes from near the top of the ground is generally impure, because it contains impure substances that soak into it from the soil. Filth is often emptied upon the ground, or buried just below the surface. When the rains come, they wash much of this through the soil into the underground sources of water. Wells dug in the ground usually furnish water of this sort. Such water is likely to cause, in those who drink it, typhoid fever or some other serious disease.

WOULD YOU CARE TO DRINK FROM THIS PUMP?

When we are not sure that water is pure, we may make it safe by boiling it for fifteen or twenty minutes. Boiling the water will give it a "flat" taste, but its original flavor may be restored by pouring it many times from one vessel into another through a colander, so as to expose it to the air. It is always

wise when there is any doubt about the purity of water to boil it, and then to store it in corked bottles or fruit jars in the ice chest.

Deep artesian wells usually furnish clean water. Rain water as it falls from the clouds is pure, but it may fall upon a dirty roof, or it may be soiled by the soot and dust which it collects from the air.

PUTTING AIR INTO WATER AFTER IT HAS BEEN BOILED

Ice which is cut from lakes or rivers is often not pure. Unless ice is known to be from a pure source it should never be put into water or other drinks to cool them. If we need to make water cold, it can be done best by placing the vessel containing it on ice, and by packing ice around it.

If we think a water supply is not good, we should have it tested by an expert. But we can first try the following test: Fill a two-ounce bottle nearly full of the water. Add a small lump of pure white sugar. Cork the bottle and leave it in a warm place. If the contents become clouded within a few days, it is of very doubtful quality and should not be used. Why, do you think?

The danger from the use of impure water is sometimes made an excuse for using wine, beer, and similar drinks. While these are part water, yet such drinks cannot take the place, to the

body, of pure water. These drinks all contain *alcohol*, a substance which robs the body of water. Their use does not quench the thirst of the body. Instead, they are likely to create thirst.

Fermented drinks

Wine is made from the juice of grapes. When the juices of fruits are fresh, they make good drinks. While the juice remains in the fruit, it keeps fresh for a long time, because the skin protects it. When the skin is broken and the juice is pressed out and left open to the air, it soon begins to change. This is caused by tiny plants, called *yeast* plants. These drop into the juice from the air, in which they are always floating. There is fruit sugar in the juice, and these tiny plants are fond of sugar. It makes them grow very fast.

IT IS BETTER TO MAKE WATER COOL BY PACKING ICE AROUND THE VESSEL CONTAINING IT THAN BY PUTTING ICE INTO THE WATER.

Wherever the yeast plants are feeding and growing, two kinds of wastes are thrown off. One is a gas, the same gas we ourselves breathe out, *carbon dioxide*. This forms in froth or bubbles on the top of the fruit juice, and finally passes off into the air. The other waste is alcohol. This remains in the liquid, giving it a peculiar taste. We may rid the juice of the alcohol by boiling it, but its first sweet flavor and freshness will have been lost through the activity of the yeast plants. This change which the yeast plants bring about is called *fermentation*.

A food or drink in which this change has taken place is said to be fermented. All such foods or drinks contain alcohol. Some contain much more than others. The alcohol can be separated from any fermented liquid by a boiling process called *distillation*.

Alcohol a poison

The process of distillation depends upon the fact that water boils at a temperature of 212° F., while alcohol boils at a much lower temperature. If you will hold a glass containing ice water over a vessel in which water is boiling, you will notice that water forms on the outer surface of the glass, as perspiration sometimes forms on the forehead. But the "sweat" on the glass does not come out of the tumbler. It is condensed steam or water transferred from the boiling vessel of water to the outside of the glass.

If the boiling water contains alcohol, the alcohol will boil and escape before the water, so that it can be condensed and collected in a cold vessel. An apparatus used for distillation is called a *still*. If we put a few drops of alcohol on a plate and touch it with a lighted match, it will burn with a pale blue flame. This is a test for alcohol.

Alcohol is a deadly poison to everything which has life. If you should pour alcohol upon a plant, it would soon die. Put any living creature in alcohol, and it will die almost instantly. A man who did not think alcohol was harmful once gave some to his pet dog with its food; very soon the dog died.

Any drink which contains alcohol is very hurtful to the body, and we should avoid its use. People seldom take enough alcohol to kill them outright; but, however small the amount they take, it is likely to hurt them little by little. Hard cider, beer, ale, porter, wine, whisky, brandy, and rum are all alcoholic drinks. Many patent medicines and so-called "bitters" contain alcohol, and ought to be avoided.

Sometimes people steep herbs, barks, and roots in water, add sugar and yeast, and brew a "homemade beer." This, too, when it is fermented, contains alcohol. Some fermented drinks contain much more alcohol than do others. Whisky, brandy, and rum are "stronger" drinks than beer, wine, and cider. Why? What do you think would happen to a person if he should drink a tumblerful of alcohol? A much smaller amount of alcohol has destroyed the life of a child.

The appetite for alcohol grows when indulged, calling always for more alcohol.

Persons who use fermented drinks are more liable to suffer from diseases than are those who do not use them, and as a rule they do not live as long. It has been noticed by physicians, too, that when such a person meets with an accident or becomes sick he does not get well so fast as does one who drinks only pure water.

The records of the New England Mutual Life Insurance Company show the mortality of moderate users of alcohol to be more than double that of total abstainers; that is, for every hundred deaths of total abstainers, two hundred twelve users of alcohol living under like conditions would die. Users of alcohol were found to suffer from *cirrhosis*, or hardening of the liver, five or six times as frequently as abstainers.

Users of alcohol are twice as likely to die of Bright's disease as abstainers.

Most boys and girls like to visit a soda fountain for a cooling drink on a hot day. A glass of pure water charged with gas and flavored with pure sirups or fruit juices is most pleasant. But there are many soda fountain drinks which are highly injurious, especially those which contain caffeine, a harmful drug. Then, too, many of the drinks at soda fountains are made harmful by the use of artificial sweets and poison-

Soda fountain drinks

ous coloring substances and flavors. Often the water used in making these drinks comes from an unwholesome source. It is better for a person to keep away from soda fountains.

REMEMBER: Pure water is the safest of all drinks. We may add to it various fruit juices if we choose, making many healthful beverages with which to quench our thirst. We shall enjoy life most if we early form the habit of

(1) never drinking for the purpose of washing down food;
(2) avoiding tea, coffee, and all fermented drinks;
(3) eating an abundance of ripe fruits.

HEALTH PROBLEMS

1. Some persons think they cannot swallow any food without taking water or milk or some other drink with it. Could you tell such a person what to do in order to be able to eat his food without washing it down with drink?

2. Show by an experiment of some sort that the following articles contain water: apples, peaches, cherries, bananas, cabbages, lettuce, potatoes.

3. How do you cool the water you drink in summer?

4. When typhoid fever breaks out in a city or town, the officials at once have the drinking water examined. Why?

5. Examine a can of fruit which has been fermented, and describe what you find. Take a little fresh fruit juice of any kind, and let it stand in the room uncovered for a few days. Describe the change which takes place in it.

REVIEW QUESTIONS

1. What proportion of the body is water?
2. Why does the body need water?
3. How does the body show that it needs water?
4. How much water does one need during a day?
5. How should one drink very cold water? Why?
6. From what sources is one likely to get the purest water?
7. What can we do with impure water to make it pure?
8. When is ice likely to be impure?

9. What is the best way to cool water?
10. What are some common *fermented* drinks?
11. Does the use of alcoholic drinks promote good health? Why?
12. Do the drinks found at soda fountains promote good health as a rule? Why?
13. Does the regular use of tea and coffee promote good health?

CHAPTER XVIII

The Choice and Preparation of Food

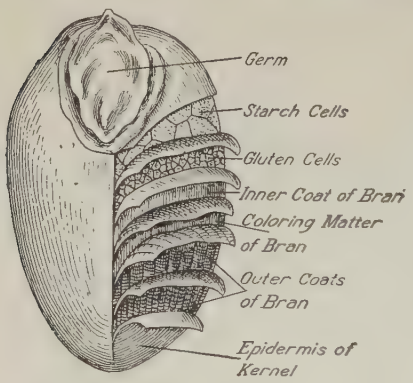
"Papa," exclaimed Mary and Henry in concert as their father was going with a basket toward the garden, "may we go with you?" "Yes, indeed," said their father; "come right along, and I will tell you about the things that grow in the garden, while you help me to gather some lettuce. And since it is a holiday, you may help me to plant some of the new seeds I brought home with me last night." As they went to the garden together, their father said: "You know that all food really grows out of the earth. The sunshine makes it grow. There are many kinds of foods to supply our various tastes and our many needs.

The food plants in the garden

"All fresh garden things are excellent for health. The peas are rich in building material for muscles and bones. They are especially good for growing boys and girls. The lettuce is rich in iron, which makes the blood red. A cow can live on green leaves alone, but we need other foods, although it is important that we should eat some fresh uncooked food, such as lettuce, celery, or fresh fruit, at least once a day, and at every meal, if possible."

The asparagus, beets, greens, and other vegetables which grow in the garden are useful both as body-building and heat-making foods. And they give a certain bulk to the food, which is necessary in order that the colon may get rid of waste matter. When the colon is inactive, as we have seen, the food remnants

ferment and decay, and the poisons thus produced, when absorbed, cause headache, a coated tongue, a bad breath, a muddy complexion, colds, catarrh, and many other serious troubles. All fresh garden vegetables are good to keep digestion active and the movement of the colon regular. The potato is one of the best of foods. Its frequent use helps to keep the tissues free from poisons.



NOTE THE VARIOUS PARTS OF A KERNEL OF WHEAT. THE MILLER WHO MAKES FINE WHITE FLOUR REMOVES SOME PARTS OF THE KERNEL THAT ARE USEFUL AS FOOD.

The grains

The father told also of grain foods, such as wheat, of which bread is made, and oats, corn, and rice. One thing about wheat is important to remember: The millers, in making fine white flour, take out so much of the best part of the wheat that graham bread, which is made of the whole wheat flour, contains four times as much *bone-building* material as does fine white flour bread. Boys and girls who want to grow up sturdy and strong should eat graham rather than fine flour bread. Graham bread also helps the colon to get rid of waste matter.

Clean fruit and vegetables

The father explained that garden soil is the home of a vast multitude of small forms of life. For the most part, these are harmless. But sometimes there are among them certain kinds of germs, or bacteria, that cause disease. Sometimes, too, the top dressing used to enrich the soil contains eggs of minute creatures which, if swallowed with one's food, hatch out in the body and become parasitic worms; these live and multiply in the intestines and do great injury.

Such eggs get on leaves and fruit which grow near the ground. So it is wise always to give such foods as lettuce, celery, cress, and strawberries a most thorough washing before using them. This is just as necessary if such foods are brought from the market. Cases of typhoid fever have been traced to lettuce eaten without cleansing. It is believed that other grave diseases come from the same lack of care.

Even those fruits that grow on bushes and trees need washing, for they get covered with the dust that flies about in the air, and dust generally carries germs or bacteria along with it.

If we gather cherries and such fruit when the sunshine has dried them just after a good shower, we shall find them clean. But fruit which comes from the market must always be well washed before it is eaten.

Dealers often keep stands of fruit for sale outside their door. There, the dust from the street gets on the fruit. A careful examination of small fruits purchased in an open market showed in the water, after washing a small quantity of strawberries, 2,000,000 living germs; from the same amount of raspberries, 4,000,000; grapes, 8,000,000; currants, 11,000,000; and cherries, 12,000,000. Some of these were disease-producing germs.

Ordinary washing of fruits and vegetables will not wholly prevent the danger from germs and parasites. Dipping such food in boiling water will destroy most of the animal parasites; but if fresh, uncooked foods have been handled by diseased persons they should be placed for five minutes in a five per cent solution of peroxide of hydrogen. A solution can be prepared and kept for this purpose in the kitchen, especially in the summer time. A new solution should be prepared every week.

One day I saw a group of boys around a huckster's cart buying apples. As soon as each had made his purchase he began to

take large bites, eating both skin and pulp. I purchased some of the apples and brought them home, but found them so dirty that they had to be covered with water and soaked for five minutes, then rinsed, and rubbed with a drying cloth before they were even decently clean. The boys must have swallowed considerable dirt.

The germs and dirt attached to fruit are sometimes the cause of intestinal troubles that are wrongly charged to the fruit itself, which would have been harmless if it had been clean.

ALL FRUITS AND VEGETABLES SHOULD BE THOROUGHLY WASHED BEFORE THEY ARE EATEN.

The common practice of picking up fallen fruit from the ground and eating it out of the hand is also a habit fraught with danger. One can hardly be too careful always to eat clean food.

To wash berries, etc.

Here is a good way to wash berries and small fruits. Put them in a colander, just a few at a time so that they will not mash, and move the colander lightly down and up several times in a basin of clean water. A woman I know always washes strawberries with their hulls on, and when it is cherries or grapes she wants to wash, or any firm fruit, she holds the colander under the faucet, and lets the water run over the fruit for a minute or more. She washes lettuce in running water. Celery she cleans by scrubbing each stalk separately with a small vegetable brush. She says she always feels that she must wash huckleberries and cranberries especially clean, for

one never knows whether the hands that picked them were clean or greasy and grimy with dirt.

But no matter how thoroughly the washing may be done, it is safer to dip the vegetables in the peroxide solution also. This is especially true of lettuce and celery, which are most likely to be dangerously soiled.

Late in the season when the corn has grown and is bearing ears, every one ought to gather some of the tender, juicy ears to eat fresh each day. May one eat corn raw? Yes, some varieties are very toothsome if gathered fresh from the stalk when each kernel is plump with the sweet juice. It is also very wholesome when cooked in various ways. One excellent way is to pick fresh ears of as nearly equal size as possible. Open the husks and remove all the silk, then replace the husks and tie them about the ears with a cord. Put the corn in a hot oven and bake for half an hour, or until it is tender. When boys go camping, they can cook corn in this way by burying it in hot ashes under live coals.

Preparing foods for the table

It is most important that all foods should be *fresh*, whether milk, eggs, meat, vegetables, grains, or fruit. Any stale food is likely to be harmful. Nature has provided some foods, such as celery, cabbage, and apples, which may with care be kept fresh and good for use during the winter season. Many roots and tubers which ripen in the fall, such as potatoes, beets, and parsnips, provide us with variety during the winter, and supply bulk for our food.

I saw Ann canning some strawberries yesterday, and this is the way she did it. First she cleaned a quart jar; then she filled it half full of water, fitted on the rubber and the top, and stood it bottom upwards on the table for a time to see if the water would leak out, because if it did, she would know the jar was not air-tight.

Next, she made a sirup by heating together one cup of sugar and one and a half cups of water. Then she filled the jar with perfect strawberries that had been well washed and stemmed. Over these she poured enough hot sirup to fill the jar to the neck. She placed the lid, but not the rubber, on the jar without screwing it down. Then putting the filled jar in a shallow pan in which was a little water, she set it in a cool oven. The heat was turned on very gradually so as not to crack the jar; at no time did she let it get so hot that the fruit juice boiled over the top of the jar. After the juice began to bubble well in the jar, the fruit was cooked for twenty minutes. The jar was then removed from the oven, with care not to expose it to a draft, the lid was lifted quickly, and a clean rubber band, which had been dipped in hot water, was slipped over the jar. Ann filled it again to overflowing with boiling sirup and screwed the lid down (not quite tight), wiped it clean, and left it to cool for an hour. Then she screwed the lid as tight as she could.

ANN KNOWS HOW TO CAN STRAWBERRIES SO AS TO PRESERVE ALL THEIR GOOD QUALITIES.

One day Ann canned some string beans. After she had washed the beans and had taken off the strings, she cooked them

until they were tender. Then she put them in a jar, just as she did the berries, filled it with the boiling water in which they were cooked, and finished canning them in the same way as she had the strawberries. Beans and other vegetables require longer cooking than fruits to make them keep well. As an extra precaution against spoiling, the cooking of the canned vegetables may be repeated for one hour on two days in succession.

This is such an easy way to can foods that anyone who tries can do it successfully.

Cabbage and other greens are of great value as sources of vitamines, which are most essential to growth and health. Some of these are destroyed by cooking. On this account it is desirable that we should eat some raw or uncooked food every day, and preferably at every meal.

Cabbage, lettuce, celery, radishes, tomatoes, and green corn are among the best raw vegetables. Turnips, carrots, and a few other vegetables are also sometimes eaten raw. Drying has somewhat the same effect as cooking in destroying some of the valuable vitamines.

Animals as well as human beings require uncooked green food to keep them in health. This is the reason for the great value of the silo to dairy farmers. In the silo a sort of acid fermentation takes place which preserves the freshness of the food and does not injure the vitamines. Sauerkraut, a food prepared from cabbage and much used in Central and Eastern Europe, like the green fodder of the silo is preserved by a process of fermentation, and is a most valuable source of green food for many millions of people. It might be more freely used in this country with advantage. After it is prepared, sauerkraut must be kept cold to prevent further changes. When it acquires a bad odor, it is unfit for use.

Every home ought to have a garden. A garden not only gives an excellent chance for exercise of a most healthful kind, but it provides many fresh foods which furnish to the body material that is not provided by other foods. They encourage

GARDENING IS VERY FINE FOR HEALTH. BUT DO YOU THINK ALL THE BOYS AND GIRLS IN THE PICTURE HAVE A GOOD WORKING POSTURE? WHICH ONES WILL TIRE QUICKLY BECAUSE OF THE POSITION THEY TAKE IN THEIR WORK?

appetite and aid digestion. It is very necessary that food should be relished. When one has a keen appetite and a good relish for the food he eats, he is almost always able to digest it and he is therefore benefited by it. But when one eats without an appetite, his food is not likely to be well digested, and it will not nourish him well.

Professor Pavlov, the great Russian scientist, has made a number of wonderful discoveries by means of large and very intelligent dogs which he trained to assist him in the study of digestion. By experiments upon these dogs, Professor Pavlov learned, among other interesting things, that the stomach prepares a digestive juice to act upon the food, while it is still in the mouth and before any portion of it has been swallowed. The simple taste of food causes an abundant outflow of this juice. The juice thus formed Pavlov calls *appetite juice*. In order that the proper amount of "appetite juice" should be produced, it is necessary that the food should be very thoroughly chewed. When food is swallowed hastily, it reaches the stomach before the latter is prepared to receive it and finds no juice ready to digest it. Professor Pavlov made many other wonderful discoveries about digestion, some of which we shall learn in future lessons.

The "appetite juice"

REMEMBER: All fresh garden vegetables are excellent for health, furnishing body-building and heat-making foods, and assisting the body to get rid of useless remnants of food. Fruits and grains also make excellent foods. The fruits and vegetables should always be cleaned before eating; and the *whole* of the grain, except the hull, is better for food than the white part merely. A keen appetite and a good relish for food is always necessary.

HEALTH PROBLEMS

1. Many of the vegetables that grow in the garden may be eaten raw. Are they better when cooked? Why?
2. Some vegetables must always be cooked. Why?
3. Some fruits you like better cooked than uncooked. Why?
4. Are there any fruits that may be eaten when green? Why?
5. How may oats be used for food? Corn?
6. In canning fruit, why must one be so careful to boil the fruit and the sirup, and seal the can air-tight while the contents are hot?

7. What is the best way to acquire a good appetite? Do you have a good appetite when you remain in the house all day? Why?

8. For what foods do you always have a keen relish? Would it be right for you to eat only those foods? Tell why.

Review Questions

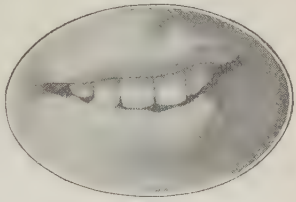
1. What should be done to garden vegetables before eating them?
2. What grains are good for food?
3. Why is graham bread better for growing boys and girls than white bread?
4. Why should fruits always be washed before they are eaten?
5. What is a good way to wash berries? Celery?
6. Is corn on the cob good for food? How should it be cooked?
7. Are potatoes good for food? How should they be cooked?
8. Tell how fruits and vegetables may be kept in good condition for use during the winter.
9. Why is a keen appetite necessary for good digestion?

CHAPTER XIX

The Care of the Mouth

The teeth have a most important share in keeping the body in health. It is only through their aid that we can bite and crush all the solid foods that we take into our mouths. In fact, their chief business is crushing and grinding food. If this is not done well, then the very first work in digesting food is left unfinished, and through all the rest of the process there will be trouble, because the food was not started off right.

Starting the food right



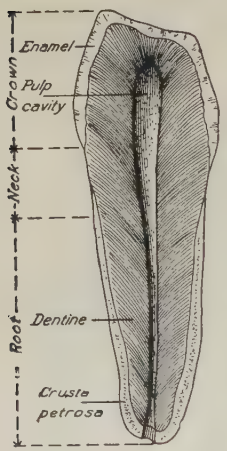
Clean, sound teeth, standing like soldiers all in a row

Of course, one cannot chew his food properly unless he has good teeth with which to do it. Even if there be but one bad tooth, or a single one missing, the chewing of food is likely to be imperfect. To do the work in the best manner requires a full set of healthy teeth.

Nature provides a young child with a set of twenty teeth, all that his little jaws are able to hold. These are for use only during the early years, and are called *temporary* teeth. As growth proceeds, and the size of the jaws increases, these first teeth drop out from time to time, and a larger set of thirty-two teeth finally takes their place. These last are called the *permanent* teeth. They are longer and stronger than the first set, and are intended for use during the remainder of one's life. If any of these are lost, others will not come to replace them.

The teeth

When the teeth first appear in the mouth, they are sound, white, and beautiful, and with good care from the beginning they may be kept so till old age. Clean, sound teeth, standing like soldiers all in a row, add much to a person's appearance. This is another reason why the teeth should receive the best care. When we see a person in whose mouth is a set of dirty, ill-kept teeth, we get much the same impression of him that we do of a person whose hands and face are dirty, or whose clothing is torn and soiled; or of a farmer whose fences are tumbling down, and whose garden is full of weeds.



WHEN YOU STUDY THE WAY THE TEETH ARE MADE, YOU CAN SEE WHY THEY MUST BE KEPT CLEAN, AND WHY THEY MUST NOT BE USED TO CRACK NUTS OR ANY THING HARD.

The chewing surface of a tooth is called its *crown*. This part of the tooth is protected all over with *enamel*, the very hardest material in the body. The portion of the tooth within the *gums* is called its *neck*. To hold it in position, it is firmly fastened by a *fang* or *root* to the jaw bone. There are different shaped teeth for different uses, — some sharp for cutting food, while others have broader surfaces for crushing and grinding. We have no teeth for tearing food, such as are found in the mouth of the dog, for we have no use for such teeth. See if you can locate these different shaped teeth in the mouth.

All are made good and strong on purpose, so that they can readily crush such foods as crackers and toast. One's teeth need exercise to keep them strong just as much as do other parts of the body, so at every meal we should eat some hard foods which need much chewing. But the teeth are not so strong that they can be used safely to crack

The teeth need exercise

such things as hickory nuts. The enamel which covers the teeth is brittle, like china, and if the teeth are used to bite hard objects, such as steel or stone, it may be very easily cracked or chipped off. So long as the enamel remains sound, the tooth is well protected.

Bacteria in the mouth

You have already been told of the tiny colorless plants so small that six hundred millions (600,000,000) of them could be packed in the space occupied by a grain of sugar. Men of science call these minute plants *bacteria* or *germs*. They abound in the air. They get into the water we drink and the food we eat. Some of them are harmless, but others do us much damage. They multiply very fast if they have a warm place and moist food. They cannot live in strong light. When they get into our mouths, as they are always doing from the air or by means of our food and drink, they find just what they like best, — warmth, moisture, and darkness. And if there be ever so tiny a crack or break in the enamel of a tooth, they seek a lodging there, and begin to grow, and to make trouble for us. Anything likely to injure the enamel, like biting wire, pulling out nails, or opening a knife blade with the teeth, or picking them with pins should be avoided. Why? Have you ever broken the enamel on one of your teeth? If so, how did you do it?

The teeth grow very close together, so that each one can help the others in chewing. Still there is a space between them large enough so that particles of the food we eat can collect in them. If the teeth are not well cleaned after meals, these particles of food make a tempting banquet for germs. The germs are not slow in taking advantage of their chance; and if there be some food left there every day on which they can feed, they may in time make holes for themselves in the enamel of the teeth. When once they get inside, the work of decay will go on rapidly.

If we are careless and neglect to keep the mouth and teeth clean, we need not be surprised to find some day that these little bacteria have begun to spoil some or all of our teeth. It has been found that nine out of ten of all the school children in the United States and England have bad teeth. What a loss this is!

If the teeth are not cleaned and polished every day, a film forms upon them. Hidden under this film, the germs which cause decay grow and multiply and bore their way into the teeth. Under the same conditions, germs attack the gums and produce ulceration of the soft parts and loosening of the teeth. In time, the teeth may even fall out.

DENTAL FLOSS TO BE USED IN CLEANING THE TEETH

Many times the germs work their way down to the roots of the teeth and produce abscesses from which the germs and the poisons which they produce are carried by the blood to all parts of the body. This may give rise to rheumatism and other painful diseases. So it is very important to take good care of the teeth. You know that to be sound a horse must have good teeth. This is just as true of a man as of a horse. A man who does not have good teeth is not a sound man.

Some people think it is not necessary to care for the first set of teeth, since they will be shed after a time. But this is a mistake. A "baby" tooth that decays is very apt to harm the new tooth that comes in its place. One that is not pulled in time causes the second to be crowded and irregular.

Even the baby's teeth need to be kept clean. A swab of cotton on a toothpick is best for this, because the baby's gums are too tender to bear the use of a toothbrush. Older boys and girls should use a small, stiff brush, — one that will reach into

IN SOME SCHOOLS THE PUPILS ARE ALL TAUGHT, AS SHOWN IN THE PICTURE, HOW TO CARE FOR THE TEETH. THIS IS A "TOOTH BRUSH DRILL."

every crevice. It should be used on every part of every tooth, outside, behind, on top, and between, brushing *up* on the lower teeth and *down* on the upper ones. A soft silk thread or dental floss should be drawn around and between the teeth to clean out small bits of food.

Keeping the mouth clean and the teeth sound

All persons, young and old, should make it a regular practice to finish every meal with a thorough cleaning of mouth and teeth. When the school bell rings before luncheon is over, and one's toothbrush is in the bathroom upstairs, one should at least rinse his mouth well with a glassful of water, and not forget to clean his teeth at night thoroughly.

THE TEETH MAY BE POLISHED WITH PAPER SUCH AS IS USED FOR PAPER TOWELS.

One should be careful to clean his toothbrush thoroughly each time after he has used it, and then keep it in a clean place so that it will not become soiled. Care should be taken also not to hurt the gums while brushing the teeth. The brush should not be so stiff that it will make the gums bleed.

A fine way to polish the teeth is to rub them with soft porous paper, such as is used for paper toweling. A piece of such paper rolled around a lead pencil makes a very good tooth polisher. A still better way is to use a little pad of paper held in a proper holder. A polishing stick should also be used. It should be made of orange or other hard wood with one end sharpened like a lead pencil. With this the surfaces between the teeth may be polished.

When the teeth are properly polished, they glisten like polished ivory, and when rubbed with the moist finger a sound is produced like that caused by rubbing wet glass.

If it is one's misfortune to have a decayed tooth, he should at once visit a good dentist, who may be able to clean it out, and fill it with some lasting substance which will prevent any further damage and make the tooth still of service in chewing. One should not delay in attending to this, or the tooth may be wholly destroyed. And it is a serious thing to lose even one tooth.

HOLDER FOR PAPER FOR POLISHING THE TEETH

We cannot always ourselves see where the germs have started their work. The teeth, by aching most painfully, often make known to us that the bacteria are at work. But by this time much harm has already been done. It is wiser to make regular visits to some good dentist at least twice a year, and have him examine the teeth and clean them. The high polish which he will give them makes it harder for the food and germs to cling to them; and if there be any places where the enamel is broken or decay has begun, he can repair the tooth before great harm has been done.

By polishing the teeth with paper and the polishing stick, the teeth may be kept as smooth and white as the dentist

leaves them. When cared for in this way, the teeth do not decay, and disease of the gums (*pyorrhœa*) will usually disappear.

Dead teeth and teeth with crowns are likely to cause trouble. Such teeth should be examined by means of the X-ray to see if there is any disease of the roots. When serious disease is found in any tooth, it should be drawn at once, not only to prevent extension of the disease to other teeth, but also to prevent the injury to nerves, joints, and other parts likely to result if the tooth is not drawn.

THE ORANGE-WOOD STICK IS VALUABLE FOR POLISHING THE TEETH. A WELL-POLISHED TOOTH WILL NOT DECAY AS EASILY AS AN UNCLEAN TOOTH.

Bad habits and bacteria

There are various routes, beside those already mentioned, by which harmful bacteria reach the mouth. One route lies through the habit, so common among children, of holding in the mouth pins, pennies, pencils, marbles, and other articles liable to carry bacteria. The practice of exchanging bits of candy, chewing gum, whistles, or anything that has been put in the mouth; wetting a lead pencil with the lips, tasting with another child's spoon, and drinking from a common cup are other ways of getting these dangerous germs into one's mouth.

Another very common harmful habit is that of putting the fingers in the mouth. The fingers more than any other part of the body come in contact with things that are more or less unclean. Things handled by many people, as books, doorknobs, the stair railing, the baseball, or bat, may each or all have on them harmful bacteria which have come from some one's hands. These may get on your own hands. If you should

then put your fingers in your mouth, what would probably happen?

About two things we cannot be too careful:

1. To wash the hands very often.

2. To keep the fingers out of the mouth and also out of the nose and eyes.

By experiments made with a drinking cup in a city school, it was found that in a space no larger than the head of a pin on the brim of a cup which had been in use for nine days, there were over one thousand bacteria. It was estimated that the edge of the cup likely to be touched by the lips in drinking bore not less than five million germs. In one school twenty-four persons who drank from a cup that had been used by a pupil having diphtheria all took the disease. In another school the teacher and every pupil who used a cup from which a child with the measles had drunk became ill with measles. It will do us little good to drink pure water, if in doing so we offer to injurious germs a lodging place in the mouth.

Avoid the public drinking cup!

WHEN ONE DRINKS FROM A BUBBLE FOUNTAIN, ONE AVOIDS THE DANGER OF SWALLOWING GERMS THAT ARE OFTEN LEFT ON PUBLIC DRINKING CUPS BY PERSONS WHOSE HANDS AND LIPS ARE NOT CLEAN.

The public or common drinking cup is a deadly thing, and no one should use it. Every person should carry a pocket cup of

his own. If one needs a drink when no cup is at hand, he may make a cup by folding a piece of paper, or he may use an envelope. A bubble fountain is an excellent and safe device for providing the public with drinking water.

REMEMBER: Sound teeth are necessary for good health. The teeth should be cleansed thoroughly after each meal; and they should be examined regularly by a good dentist. The mouth is a door to the body. Keep it closed against germs.

HEALTH PROBLEMS

1. If you can do so, look at the teeth of a three-year-old child and describe their appearance and their condition.
2. Where in the mouth are the teeth used for cutting food? Where are those used for crushing food?
3. What may happen to one's teeth if he uses them for biting wire or nails?
4. Suppose one should always gulp down his food without grinding it, or should eat only mushes, what would happen to his teeth? Why?
5. Figure out which will take more time, to rinse or brush one's teeth after each meal, or to have one or two or more decaying teeth filled by a dentist each year. Which will cause more trouble and expense?

REVIEW QUESTIONS

1. What part do the teeth play in keeping the body in health?
2. What are the "baby" or temporary teeth? The permanent teeth?
3. What may cause teeth to decay?
4. What is the crown of a tooth?
5. What is the enamel? What is its use?
6. What will happen to the teeth if the enamel is broken?
7. What exercise strengthens the teeth?
8. What is meant by *bacteria* or *germs* in the mouth?
9. What will help the growth of germs in the mouth?
10. How often should one clean the teeth?
11. How should the cleaning be done?
12. How often should one visit the dentist? Why?

CHAPTER XX

The Care of the Skin

Any one who has ever had the mishap to tear a piece of skin from a finger, toe, or other part of the body knows how the tender flesh underneath smarts and stings until it is protected from the air by a suitable dressing. One who has had the bad luck to get dust or dirt on such a raw place has probably had to endure a painful sore.

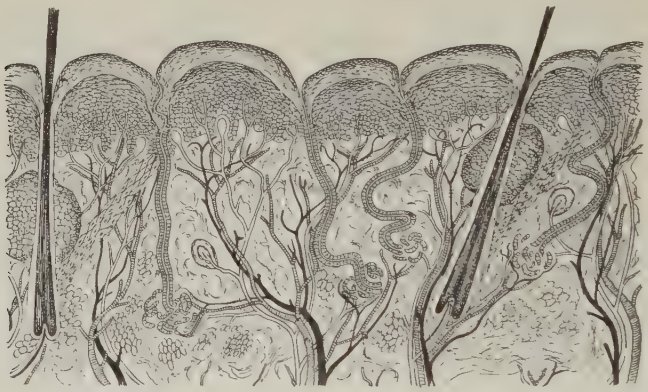
The skin, which clothes the whole body, protects the sensitive flesh. The skin is soft and smooth. It stretches enough for us to bend an arm or leg easily, and it is never too small, no matter how much we grow. It is so strong that it does not break easily when we come in contact with rough objects. It fits so perfectly that it has the exact shape of the body. At the lips and nose it becomes finer and softer and is called the *mucous membrane*, "a lining skin." This membrane lines the nose, mouth, throat, and all the inner parts of the body.

The perfect garment of the body

Some persons like to strip the spicy bark from a birch tree and chew it. If you have ever done this, or have peeled the bark from some other young tree, you have doubtless observed that on the outside there was first a very thin layer resembling paper, and under this a much thicker bark next to the wood. It would not do the tree much harm if you should remove this outer bark. Indeed, the bark of white birch trees peels off itself little by little. The bark of the tree does not stretch enough

to make room for the increase in size as the tree grows; so the outer layer tears, is shed as the wood beneath it needs more room, and the new bark grows to take its place.

If you tear off the inner bark, it will injure the tree. It will make it "bleed"; that is, it will cause the sap to flow freely. The sap, we may say, is the blood of the tree. If the torn place is



YOU COULD TAKE A STITCH IN THIS SCARFSKIN WITH A VERY FINE NEEDLE AND THREAD WITHOUT MAKING IT BLEED OR CAUSING PAIN. IS THIS A WISE PROVISION?

not too large, it may heal over, but an ugly scar will remain in its place.

The skin covering our bodies, like the bark covering the tree, is made up of two layers. The outer layer is called the *scarfskin* or *epidermis*. It is thin, like the skin that lines an eggshell. There is no blood in this outer skin; neither is it very sensitive. Using a very fine needle and thread, you can take a stitch in it without making it bleed or without causing pain. The scarfskin has several thin layers of small scales joined at their edges. Those in the outside layer are no longer of use, and are all the time being shed or rubbed off. Every time the hands are washed with soap and water or rubbed with a

The scarfskin

towel some of these scales are rubbed off. It is a curious fact that new ones are all the time crowding the old scales upward to the top.

On most of the body the outer skin is very thin. It is thickest usually on the palms of the hand and the soles of the feet, because these parts more often come in contact with hard objects, and hence need better protection. Can you locate the tough parts on your hands and feet? Is there some such thick skin on any other part of the body?

The underside of the first skin is colored, being spread over with tiny grains of coloring matter called *pigment*. In colored persons this pigment is sometimes brown, and sometimes nearly black. White persons have very little of it. The heat of the sun increases the pigmentation, and this is why the skin tans when much exposed to the sunshine. If the coloring increases in spots, the skin appears *freckled*.

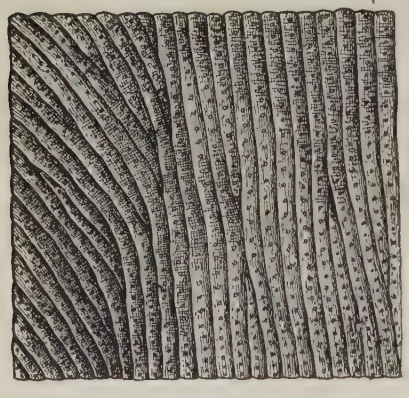
The inner or second layer of skin on the body, like the inner bark of the tree, is much thicker than the outer layer; it is also more important, and so is called the *true* skin, or *dermis*. **The true skin**

If we scratch or cut this skin, it bleeds and smarts. If we meet with a mishap which destroys a portion of it, there will be a scar when it heals, — a sort of patch by which Nature tries to remedy the defect. Have you a scar of this sort?

Besides protecting the body from injury, the skin serves the body in several other ways. We can tell by means of it whether objects are rough or smooth, whether hard or soft, and whether cold or hot.

If we look through a magnifying glass at the palm of the hand, we find it covered with very fine ridges and furrows. Along the top of the ridges appear many little dark spots. These are very tiny holes called *pores*. Each pore is **Our pores**

the opening for a very small tube which runs down through both layers of the skin. At the lower end it is rolled up in a coil, as you see in the picture. These coils are *perspiratory glands*, so called because they separate from the blood the fluid we call *sweat* or *perspiration*. There are more than three millions of them in the skin, but they are most numerous on the palms of the hands and the soles of the feet. These glands are always busy at work sending out perspiration through the pores, although we usually do not notice it except when it flows so fast that it forms in drops.



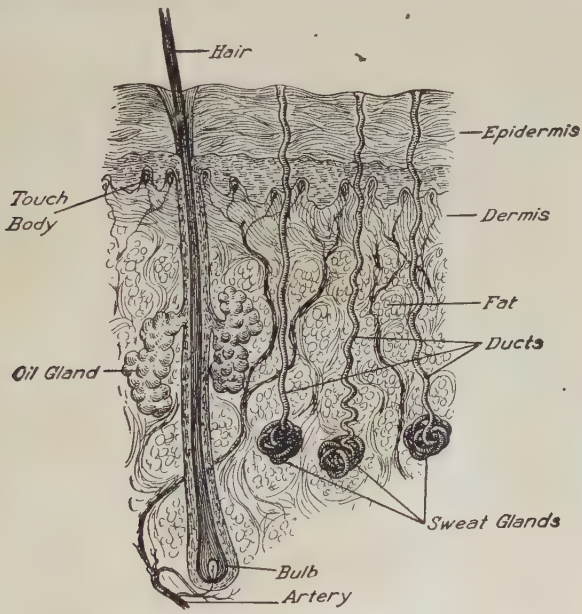
WHEN YOU LOOK AT THE PORES OF THE SKIN, OR OPENINGS OF THE SWEAT DUCTS, YOU CAN SEE HOW IT IS THAT SWEAT, OR PERSPIRATION, CAN COLLECT ON THE SURFACE OF THE SKIN WHEN WE BECOME VERY WARM.

We can make sure that the skin secretes moisture by trying a simple experiment. Press the finger tips or the whole hand for a moment on the dry surface of a mirror or some brightly polished metal. The place which the hand covers will look moist and dim. This is because perspiration oozed out of the pores of the hand while it was on the glass, though we could not see it by merely looking at the hand.

When one is working or playing hard, or when he gets very warm, the perspiration flows so freely that it collects on the surface of the skin in big drops. But at other times it flows slowly and we do not see it. Yet during each twenty-four hours almost enough to fill a quart measure passes from the body of an adult. If one is working hard, the amount given out may be very much greater than this.

As soon as the perspiration reaches the surface, it evaporates, and in so doing makes the body cool. This is another useful thing the skin does for us. It helps to keep us cool in hot weather; or, in other words, it regulates the heat of the body. When the skin is moist with perspiration, we should take care not to sit in a wind

How the skin regulates the body heat



THE PERSPIRATION, OR SWEAT IS COLLECTED FROM THE BLOOD BY THESE SWEAT GLANDS.

or a draught, for we may be chilled by the rapid evaporation of the moisture.

You can see how this happens by moistening the finger nail, and blowing upon it. Although the breath is warm, the nail will feel cool because of the rapid evaporation of moisture.

The perspiration is mostly water, so the more we perspire the

more water we need to drink in order to keep the proper supply of moisture in the body. It also contains a considerable amount of waste matter formed in the body. Thus the skin serves another purpose — it rids the body of waste.

There are other glands in the skin besides the perspiratory glands. These make oil, and pour it out upon the surface to keep the skin soft and smooth. Show in some way that the surface of the skin is oily.

There are curious little pockets, too, from each of which grows a hair. Oil glands provide the hair with oil to keep it soft and glossy. Show in some manner that these oil glands supply oil for the hair.

The nails of the fingers and toes grow out of other little pockets in the skin. Both hair and nails are only portions of the outer skin, which has been curiously changed and hardened. The nails were intended to protect the ends of the fingers and toes, and to give them firmness.

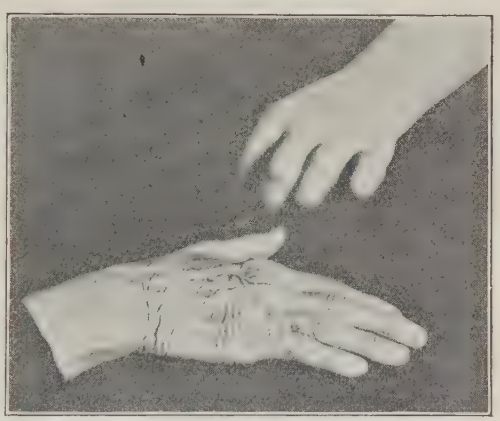
The appearance of the skin more than any other feature makes the face ugly or beautiful. In order to keep the skin in health it must be kept clean. The waste matter which forms a part of the perspiration does not evaporate along with the water, but dries upon the skin, making a sort of film all over the surface. If this is not removed, the film begins to decompose, giving rise to a very unpleasant odor. But the offensive smell is not the worst thing. The poisons formed are absorbed into the body and produce various painful and disgusting diseases of the skin.

A healthy skin must be clean

Sometimes people try to hide a dingy skin on the face by covering it with paint or powder. This is a sham. It does not help the real trouble at all. The skin cannot be made soft and white by such means. Besides, these paints and powders sometimes contain poison.

The really beautiful skin is the healthy skin. And as we saw above, to keep the skin healthy, it must always be clean so that its perspiratory glands will be active and its pores will be open. Indeed, the whole body must be kept clean, — clean on the outside and clean on the inside, — that the skin may be kept in health. A clean, moist, healthy skin is the sign Nature hangs on the outside to indicate that the whole body is in good health.

The appearance of the skin is a sign of the condition of the health. A dingy skin, a clammy skin, a dry, wrinkled skin is an indication of disease and feebleness. It may truly be said that a person is as old as his skin. The glands of the skin and its other structures shrivel and waste away in old age. Brown spots appear upon the skin and disfigure it. These are due to the deposit of poisonous coloring matters in the skin.



THE WRINKLED SKIN OF OLD AGE CONTRASTED WITH THE SMOOTH, ELASTIC SKIN OF YOUTH

The skin in old age loses its elasticity. Instead of being elastic like rubber, lying smoothly over the bones and tendons, the skin over the back of the hands, by pinching with the thumb and finger, may be made to lie up in folds as shown in the accompanying picture. This cannot be done in a person whose skin still retains its youthful elasticity, and it is a sure sign of old age, as is also the thinning of the skin, which sometimes becomes so transparent that it has the appearance of parchment, and the

blood-vessels and other parts can be seen through it. This condition of the skin is very significant, for while the wasting process is going on in the skin, the same thing is taking place in the liver and kidneys and other important structures in the interior of the body.

Daily cold bathing, sun bathing, and exercise in the open air are highly important means of keeping the skin healthy. When the skin is kept healthy, the rest of the body is also likely to be in health.

Bathing

Most children wash their face and hands every morning upon rising. The rest of the body needs care as well as the hands and face. The air and sunshine bathe the face, and its skin is kept much freer by their action from the waste of the body than are the parts of the body which are covered with clothing. Why? The entire skin should have a daily cleansing. A morning bath is an important health habit. For a person in health, a cool or cold bath is better than a warm one, because it not only serves to cleanse the skin, but it makes one feel fresh and full of energy. Cold water, too, hardens and trains the skin and makes one less liable to colds. The person who makes it a habit to take a cool or cold rub regularly every morning will soon have his skin so trained that he will be protected against "colds."

A BATH THERMOMETER SHOULD BE FOUND IN EVERY BATHROOM AND SHOULD BE USED TO REGULATE THE TEMPERATURE OF THE BATH.

The temperature for what is called a *cool* bath ranges from *70°* to *80°*, a *cold* bath from *60°* to *70°*. Delicate persons should test the water with a bath thermometer.

If one is not used to cold-water bathing, he should always

begin with moderately cool water, and gradually make it colder. In this way one can, after a time, take a cold bath with no harm to himself. There are some points, though, which one should always bear in mind when taking a cold morning bath:

Rules for the cold bath

1. The room in which the bath is to be taken *must be warm* (70° to 80°).

2. Whenever possible, a short hot bath should precede the cold bath. The best way is to take a hot shower for a half minute and follow immediately with a cold shower.

3. Always bathe the face and neck first with cold water before bathing the rest of the body.

4. The cold bath should be taken *at once upon rising, while the whole body is still warm.* It is not safe to run about barefooted and in night garments after getting out of bed before taking a cold bath. *A cold bath to a cold body is dangerous.*

5. If on getting up in the morning the hands or feet are cold, or if one feels at all shivery, a short (2 to 4 minutes) hot bath should first be taken to warm the body, and after that the cold bath may be taken. If there is no hot water, warm the body first by rubbing it with a towel; or by some brisk exercise, such as jumping up and down for a few minutes.

6. Cool or cold baths should be of *short duration.* Half a minute is long enough. The colder the water the shorter the bath should be.

7. After a cool or cold bath, every part of the body should be rubbed over briskly with a towel until it *looks red* and feels warm.

8. The drying should always be quickly and thoroughly done.

Cool and cold baths may be taken by a plunge in a tub of water of the proper temperature, or by a shower or spray of water over the entire body, while one is standing with the feet in warm water.

If one has no spray apparatus, a small tin watering can such as the gardener uses to water flowers, filled with cool water, will serve as well.

A boy who wanted a shower bath each morning fixed one for himself by suspending from the ceiling just over a washtub a

large tin pan, the bottom of which he had punched full of holes. Above this he hung a tin can for holding water. A hole in the bottom of the can was stoppered with a large cork. To this cork he tied a long string so that when he stepped into the tub he could pull the string, thus drawing out the cork and letting the water out into the pan to fall on him in a shower.

IF ONE CANNOT TAKE A COOL WATER BATH EACH MORNING HE CAN AT LEAST TAKE A COLD AIR BATH, AS THIS MAN IS DOING.

One can take a cold rub with just a washbowl full of water, and two towels. Wet one of the towels and with it rub first the face and neck, then the arms and chest, abdomen, back, limbs, and feet in the order stated. Rub each part dry with the dry towel before wetting another part. For the back, fold the wet towel lengthwise and wring nearly dry. Then with one end over the left shoulder and the other under the right arm rub crosswise. Then change to the other shoulder. Dry in the same manner.

When one has no conveniences for a cold-water bath, he may take a cold-air bath. A good way to do this is to sleep with one's windows open to the outer air. In the morning jump out of bed, disrobe quickly, and with a coarse towel, rub every part of the body hard and fast while

A cold-air bath

exposing the body to the air for a half minute in winter time, and for three or four minutes or longer in warmer weather.

One should always feel warm and in a glow at the end of a cold bath. If after any cold bath you feel shivery or cold when well dried, then something is wrong. Probably the bath was too long. In any case, the proper thing to do is to exercise hard until you are warm. The next time make the bath shorter.

If you feel giddy or faint in a warm bath, leave it at once, dash cold water over the body, lie down, sip cold water, and put cold water on the face and head.

Besides the daily morning bath to exercise the skin, one needs a warm soap-and-water bath for cleansing purposes at least twice a week. In warm weather, baths for cleansing are needed more often. Why?

The best time for a warm (95°–98°) bath is at night just before going to bed. It should always be the rule to end the warm bath with an all-over dash of cooler water.

A hot bath, when one is in health, should be very brief; and always at its close the body should be cooled off in some quick or sudden manner, with a spray or shower, or with a large dipperful of cold water dashed over the entire body.

One should not bathe just before or soon after eating. Why? One should exercise vigorously after a cold bath. Why? One should rest after a warm bath. One should never take a cold bath when very tired, or when perspiring. Why?

The well-trained skin

There are some races of people who, while living in a climate quite like ours, have such well-trained skins that they do not at all mind the cold, although they wear very little clothing. A gentleman who was traveling in the West met an American Indian working without either shirt or coat. It was a cold, chilly day, and the gentleman in surprise asked the Indian, "Are you not cold?" The Indian

replied by asking, "Is your face cold?" "Why, no," replied the man. "Well," said the red man, "the Indian all face." The skin of his body had become so used to the air that it did not feel the cold any more than his face did.

Some parts of the body require more frequent cleansing than others. Our hands, which come in contact so often with dust and dirt, need to be washed several times a day. Should one always wash them before eating? Why? If possible to do so, the best way is to wash them with soap in a running stream of water, as under a faucet. If we must wash in a basin, we should use a second or even a third basinful to rinse the hands. The hands ought always to be made very clean before using them in washing the face. In bathing the face, rub the eyelids from the far corner inward toward the nose.

Hygienic washing

Take care to avoid spattering dirty water into the eyes while washing the hands, as disease germs which may cause inflammation of the eyes may easily enter them in this way. Always wash the hands after handling soiled objects.

Wash cloths and nail brushes must be clean and not too coarse. A sour-smelling or musty wash cloth must be washed with soap and boiling water before it can be safely used.

Pure soap is also important. Most children prefer a scented soap, but they should be sure that it is pure. Very poor soap often has a pleasant smell. Mottled castile soap is safe and pure. Soap used should always be thoroughly rinsed off from the skin with clean water, and then the skin should be well dried with a clean towel. Lack of care in this respect often causes the skin to chap.

Never dry hands or face on a public towel which some other person has used. If your school is not provided with individual towels, you should bring your own towel from home just as you do your drinking cup. Even in one's home, each person should

have a separate towel. Some most loathsome diseases may be conveyed from one person to another through the use of towels. The better way is for each person always to have his own toilet articles.

The hair and scalp (that portion of the head upon which the hair grows) need to be kept clean. A thorough brushing of the

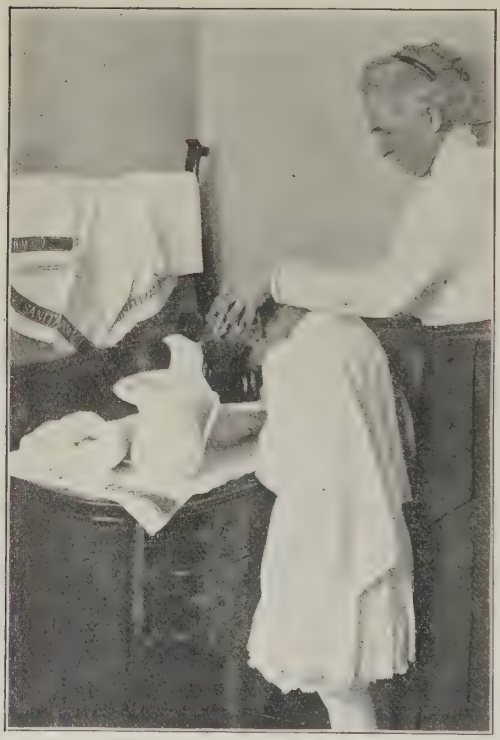
VERY BAD DISEASES ARE SOMETIMES CAUGHT BY USING TOWELS WHICH HAVE BEEN USED BY OTHER PERSONS.

hair for five minutes every day aids in keeping it clean, and makes it grow. Do you know why?

There are no set rules as to how often to wash the hair. It should be cleaned whenever it is dirty. When one lives much amid dust and dirt, the hair as well as the body will need washing often.

Washing the hair

As we have seen, nature provides the hair with oil from little glands in the skin. If the hair be kept clean and healthy, no other oil will be needed. Hair oils used on the scalp are likely to become rancid or foul in the hair, and they gather dust; they should therefore be avoided. Rubbing the scalp briskly for two or three minutes each day with the fingers moistened with cold water, will help to keep the hair healthy.



IT IS VERY IMPORTANT TO KEEP THE HAIR AND SCALP CLEAN AND SWEET. BEAUTIFUL HAIR ADDS MUCH TO ONE'S APPEARANCE. PEOPLE WHO NEGLECT THE HAIR ARE APT TO BECOME BALD WHILE STILL YOUNG.

To wash the hair one needs a bowl, a pitcher of tepid water, one of cold water, some pure soap, and plenty of soft towels. Begin by brushing the hair upwards towards the top of the head (it is easier to handle from the front) and make sure that it is straight. If the hair is tangled when it goes into the water, it will come out tangled. With long hair it is well to oil the free ends. Make a good lather with the soap. Rub this well through the hair and over the scalp with the ends of the fingers. Afterwards, the soap must be wholly rinsed off. A warm

spray is best for this, but the hair may be dipped in and out of a bowl of water, changing the water two or three times. Finish with a gentle dash of cold water to prevent taking cold. Dry by rubbing the hair between soft towels; and, in warm weather, gently shake it in the outdoor air and sunshine. In cold weather the heated air rising from the furnace will help to dry the hair. Always brush out the tangles while damp, as the hair is easier to straighten then.

IT IS EASY ENOUGH FOR A BOY TO DRY HIS HAIR AFTER HE HAS WASHED IT, BUT IT IS VERY DIFFERENT WITH A GIRL.

The hair needs sunshine and fresh air, so that the less it is covered the better. Hats and caps should be worn only out of doors. Combs and brushes for use on the hair should be kept clean. A woman I know makes her brushes clean in this way: she puts a dessert-spoonful of ammonia with a quart of water in a shallow basin, then dips the brushes in it, taking care not to wet the backs. In two or three minutes the dirt comes out. Then in the same way she dips them in clean water to rinse them shakes the water out, and puts them on a rack to dry.

Finger nails need special attention, not only because dirty nails appear untidy, but because the dirt which collects underneath them often has mixed with it some of the worst kind of

disease germs. The nails may be kept clean very easily. When washing the hands, scrub the finger nails with a brush, and clean with an orange-wood stick.

Caring for the nails

It is not wise while the nails are dry to clean them with a knife or other sharp metal instrument which will scrape them. Such treatment will make the nails rough, and harder to clean the next time. The nails should never be bitten or torn off. Trim them carefully and evenly with sharp nail scissors.

THIS IS THE WAY ONE'S HANDS SHOULD LOOK; CLEAN, SMOOTH NAILS WELL-TRIMMED AND NOT "IN MOURNING."

Especial care should always be taken to cleanse the hands thoroughly with soap and water after visiting the toilet. Neglect of this has many times caused an outbreak of typhoid fever. Infection and inflammation of the eyes may be due to the same cause.

When a person walks much in dust and dirt, his feet should have a daily bath at bedtime, whether he takes a full bath or not. If one goes barefoot or if the feet perspire much, a tepid water-and-soap bath, with careful rinsing afterward in cold water, should be taken every night. After the feet are thoroughly dried with a soft towel, it is a good time to attend to the toe-nails, which like the finger nails should be kept clean and well trimmed. Cut them straight across, never round or pointed, as this is liable to make them grow into the flesh.

REMEMBER: Every machine needs to be made clean before it can do good work. The person who takes care to keep all parts

of the body clean can work and study better, and will feel better than one who is careless in this respect.

Health Problems

1. Why should the *scarfskin* or *epidermis* not be very sensitive? What would happen to us if it were very sensitive?
2. Have you ever had callous places on your hands or feet? What are they? Do they hurt when you pinch them? Why?
3. Rub your hands or fingers over a piece of writing paper a number of times, and then see whether you can make a clear mark on it with pencil or pen. Explain.
4. What would happen to one if he should smear paint over all his skin, so that it would stop every pore? Why?
5. Which would use up more time, do you think, to take a cold rub every morning, or to be ill with a "cold" for two or three weeks every winter?
6. Should a person use on his hair a brush or comb which has been used by other persons? Why?

Review Questions

1. What is *scarfskin* or *epidermis?* What is its use?
2. What is the *true* skin or *dermis?* What is its use?
3. What is the pigment and where is it located?
4. What is the meaning of "getting tanned"? What causes freckles?
5. Is perspiration good for the body? Why?
6. Why should one not sit in a cold draught just after perspiring freely?
7. How must the skin be cared for in order to keep it smooth and beautiful?
8. How does the skin secure the oil needed to keep it soft and elastic?
9. How often should one bathe the entire body? What is the best time for this bath?
10. What should be the temperature of the bath at night? In the morning?
11. How should one take his morning rub?
12. What dangers should be avoided in taking a cold or a warm bath?
13. How should one finish a hot bath?
14. How should one care for the hair? for the nails?

CHAPTER XXI

Clothing the Body

Do you know that all machinery when at work makes heat? The working of the living machinery within the body creates heat. The harder it works the more heat it produces. If all the heat remained in the body, we should feel much too warm, as one does when he has a fever. So Nature has arranged for the skin to carry off some of it through the perspiration, and in other ways of which we shall learn later. It happens then that almost all the surplus heat of the body escapes from the skin.

One of the chief reasons for wearing clothes is to prevent the too rapid loss of this heat. Clothes in themselves furnish us no heat. They keep us warm, but they do so by helping to retain the heat of the body. The kinds of cloth which do this best make what we call the warmest clothing. For this reason we choose woolens for cold-weather wear. Linen, cotton, and silk, which permit the heat to pass away from the body much faster than wool, make cooler garments for summer use, but are not warm enough for winter wear when one is out-of-doors. At the same time, too much clothing makes the skin very sensitive, and in this way one becomes subject to colds.

Clothes prevent loss of heat

Just how much clothing one ought to wear depends upon several things:

The proper amount of clothing

1. How the skin has been trained. A skin that is kept healthy by cleanliness and the use of the daily cold bath requires less clothing than a neglected skin.

2. Age and health. Old people, babies, and persons in ill health, being less able to resist cold than others, require more protection by clothing.

3. One's habits of living. Those who live in warm rooms during cold weather need little if any more clothing while indoors than they wear in summer. Upon going out-of-doors, even if it be but for a few minutes' stay, additional garments should be put on.

4. While exercising we require less clothing than when inactive. Why?

5. The weather. We must vary our clothing to suit the weather. We ought not to make a rule that because it is summer we will wear thin clothing all the time, or that since it is April we will leave off our winter underclothing. Cold days occur in summer and warm ones in winter. Even the warmest day of summer may be changed to a cool one in a few hours by a thunder shower. One ought to adapt his clothing to the weather regardless of the season.

When going out-of-doors in cold or wet weather, one should wear extra garments on the feet and limbs as well as on the upper part of the body. These should at once be removed on coming into the house. Outdoor wraps should not be so heavy as to tire one in wearing them, nor so warm as to cause perspiration. Several thin layers of cloth keep us warmer than one thick one of equal weight, because between each garment and the next is a layer of air which helps to hold the warmth.

Clothing for cold weather

All kinds of clothing should be porous, that is, should permit the air to pass through. Chamois jackets and rubber raincoats which we sometimes need to protect us from wet and cold are air-proof, and not suited for constant use. The perspiration from the skin, when there is no air to evaporate it, clings to the

body and the clothing. After taking off a raincoat which has been worn for some time, the clothing is often so wet that the air will soon chill one. Unless one changes his clothing quickly or exercises until his clothing becomes dry, he may get a severe cold. Rubbers make the shoes and stockings damp if kept on for a long time. They should not be worn indoors. On taking them off one should change to dry shoes and stockings if he has time for it. Rubbers after being worn should be dried before wearing them again.

Wet clothing

If on the way to school you should be caught in a shower and your clothing should get wet, ask your teacher to allow you to go home to make a change, or to permit you to keep exercising until your clothes are dry. Even when sitting or standing, one may exercise vigorously by alternately contracting and relaxing the muscles of arms and legs.

If the feet get wet, the shoes and stockings should be changed as soon as possible. If the feet have been wet for some time and are cold, first put them in a bath of hot water for a few minutes, until they are warm and well reddened. Lift the feet from the hot water, and dash a dipperful of cold water over them; then rub them dry with a coarse towel. Cold feet may also be warmed by first rubbing with cold water and then with a dry towel. Woodsmen sometimes warm their freezing feet by rubbing them with snow.

The color important

Probably it has never occurred to you that the color of a garment makes any difference in its warmth, but it does. If you have ever seen a polar bear you know that its coat is white; and white is the color of the fur of many other animals in the cold North. This is for protection from foes and also for warmth, as white garments are warmer in cold weather, except in the bright sunshine, than those of darker color. White and light-colored clothing are also cooler in summer.

People living in hot countries have learned this. Light-colored clothing is warmer in winter and cooler in summer than dark clothing for the reason that white or light colors reflect or turn away the heat of the sun and so protect us from overheating in summer, and they also protect us from cold in the winter by preventing the escape of the body heat.

We should be able to move as freely with our clothes on as without them. Clothing which is too tight to permit the body to bend with ease in all ways is too tight to be worn. When children grow fast, it often happens that their clothing, which of course does not grow with them as does the skin, gets so tight and small that it binds and squeezes the body most uncomfortably. Tight belts, tight collars, tight bands, tight waists, tight corsets, tight garters — all do harm. If one wants his body to serve him well, he must provide ample room for it in which to work.

Tight clothing harmful

The strong bones of the shoulders can bear the weight of one's clothing better than any other part of the body. To have one's clothing hang from the shoulders is the best plan. To support the clothing from the waist is hard on the body, for the weight of the garments thus becomes a constant drag upon the delicate organs within the body in the vicinity of the waist. And, sooner or later, these will get so pushed out of place that harm will result.

The weight of the clothes

In order to keep the body clean one must, of course, wear clean clothing. Garments worn next to the skin are very soon soiled by the perspiration. On this account the underclothing should be changed frequently, even though it may look clean. Garments that can stand boiling can easily be made clean. For this reason cotton and linen underclothes are to be preferred. In cold weather, a thin cotton undersuit with a light one of wool worn over it makes a good

Clean clothing

combination. Heavy, closely woven fabrics afford less warmth than light, porous underwear, besides being less healthful and comfortable.

Clothing worn during the daytime should be taken off at night and hung open to the air, so that the moisture received from the body may dry out. Would it be best to hang it in a room other than the one in which one sleeps? Would it be proper to hang it in a closed wardrobe or closet where air cannot reach it?

Garments worn at night should be aired every day, and so also should the bed coverings, which are really a part of our night clothing. What do you think of the practice of rolling up the clothing worn at night, and tucking it under the pillow during the day?

Underclothing absorbs more or less of the waste matter thrown off from the body; and even though aired daily, it becomes in a few days too soiled to be used again until made clean. When we lay such garments aside to await wash day, we should not leave them in heaps on the floor of the bedroom or clothes closet. Soiled clothing spoils the air of a room. Such clothing should be kept in a bag or basket out of the living or sleeping room. Dresses and coats of cloth that hold dust should first be brushed and shaken out-of-doors before being hung in the clothes closet. Clean the shoes and rubbers out-of-doors before putting them away.

One depends so much upon his feet to support his body when he walks, runs, jumps, skips, skates, and climbs that he cannot afford to cripple their usefulness. So he must be careful how he clothes them. Many children prefer to go barefoot in summer. Would they go barefoot in winter, too, were it not for the cold? There are many people in warm countries who go barefoot all the time. They can walk very fast, and the soles of their feet become so hardened that they do not mind the rough roads.

In Porto Rico, Mexico, and Egypt I have seen many old persons who had never worn a shoe; but these are warm countries.

The feet feel most comfortable when unshod. It is well to go barefoot indoors so long as our feet are not cold. But it is not always safe to go out-of-doors without some kind of foot covering. In certain parts of the country the soil is unclean, and full of the tiny *hookworms* that enter the body through the skin of the feet and cause a serious disease. In many places where children love to go, there is danger to bare feet from germs, from rusty nails, and pieces of glass, so that it seems wisest to wear sandals to protect the soles.

Shoes

IF WE WEAR SHOES THAT ARE TOO NARROW OR TOO SHORT OR TOO TIGHT OR THAT HAVE TOO HIGH HEELS WE SHALL BE UNCOMFORTABLE AND WE MAY INJURE THE FEET. SENSIBLE SHOES ARE SHOWN IN THE PICTURE.

The proper shoe is one that has the shape of the natural foot. People often wear shoes that are too narrow or too short. Do you think it is sensible to do this? With high, narrow heels one cannot walk or stand gracefully, and the muscles are strained and injured. Shoes with very thin soles ought not to be worn in cold or wet weather. Why? Tight shoes cause cold feet. They also make *corns*, and otherwise harm the feet. It is a good plan to use two pairs of shoes, wearing one pair one day and the other the next day. It costs no more to do this than to have but one pair. Shoes, like other clothing, get foul with body waste; and they should be given a chance to air and dry, so that they may be kept clean for wear. The stockings should be changed often, and always dried and aired at night.

REMEMBER: Health and comfort demand that one should wear clean, dry, porous, and loose-fitting garments. Very tight-fitting shoes, collars, and the like should be avoided.

CARE OF THE FEET

From earliest infancy the little socks or shoes should not restrict the toes. Nature should be given the chance to shape the feet.

Children's feet should go

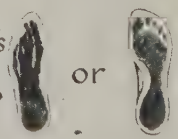
Not in like the duck's

Nor out like the cormorant's

But straight like the Indian's

This will rest the weight of the body evenly on the soles and prevent "Flat Foot"

Do your child's feet have to fit his shoes?



or

Do your child's shoes fit his feet?

Two-thirds of his life will be spent in his shoes. See that he has a proper footing for life.

Health Problems

1. Take out doors a thermometer which registers below 50°. Put it next to the body, inside the clothing, and notice how quickly it rises. Where does the heat come from?

2. Put a piece of woolen and one of cotton cloth against the face or any part of the body. Which feels the warmer? Why?

3. Do you think people who wear heavy mufflers about the throat in winter avoid having sore throats? Why?

4. Why do we use storm windows in winter — to keep out the cold or to keep in the heat?

5. Why do some people use hollow tiles in the walls of their houses when they build them?

6. On a very hot day, people often put water on the face, hands, and neck, and let it dry in the air. Why?

7. Why do we so often speak of *wet* days as *cold* days?

8. Feel a thick, hard-woven suit of underwear and a loosely woven, fluffy one; which feels the warmer? Explain.

9. Which is warmer, a heavy, hard quilt, or a light, fluffy one? Why?

Review Questions

1. From what source does the heat which makes the body warm come? Is the heat all kept in the body?

2. What are the best kinds of material to keep the heat of the body from escaping? What kinds permit the heat to escape readily?

3. Can the skin be trained to endure cold? How?

4. Why do many people take "cold" easily in winter?

5. How should one dress when going out in cold or wet weather?

6. What is the objection to wearing raincoats, rubbers, and very thick, heavy clothing all the time?

7. Does the color of clothing make any difference in regard to its warmth or coolness?

8. What is the objection to wearing tight belts or collars or bands?

9. What is the best cold-weather combination in underclothing?

10. What should be done at night with clothing worn during the day?

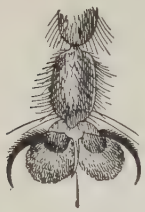
11. Why should one be careful to clothe the feet properly?

CHAPTER XXII

A Disease Carrier — the House Fly

Have you ever looked at a house fly under a microscope? If so, you probably noticed that it was a curious little creature with two wings, a body with three divisions, six hairy legs, and wonderful feet, looking much like the claws of a crab. A pair of pincers at the end of the claws enables the fly to cling to uneven surfaces. Spongy pads on each foot make it easy for the insect to adhere to smooth surfaces and even to walk on the ceiling. The accompanying picture of a fly's foot, many times enlarged, shows how wonderfully it is made.

Flies are germ carriers



When you look at the foot of a fly, many times enlarged, you can see why it can easily walk on ceilings, and stick on any object on which it alights. You can see, too, why dirt sticks to a fly's foot when it walks in dirty places.

With such legs and feet, it is impossible for a fly to walk in or on any sticky material without getting more or less soiled by it. If the fly always took its walks in places that are clean and wholesome, this would not matter very much. But the fly is one of Nature's *scavengers*, and feeds on filth. So it has to walk among all sorts of foul stuffs in order to make its living. Bear in mind, also, what we have already learned, that germs of many kinds abound in filth. Then it will be plain how it happens that the fly generally has an army of germs on each of its six feet. The parts of its mouth, also, which are made

for lapping and sucking get smeared with its filthy food. Its wings, too, catch germs as they brush against filth wherever the fly alights to feed. So the fly gets well covered with germs; and as it flits about from place to place, it carries them along. One fly was found in a recent test to have 6,600,000 bacteria on its body. That seems a big load for a little fly to carry; but one such germ is as much smaller than a fly as a fly is smaller than an elephant.

If you watch one for a time, you will see it rub off the dirt, and polish its feet, wings, and mouth. The trouble about this is that it does not care where it does its cleaning; and it is just as likely to wipe its feet on a lump of sugar or on the berries in your saucer as anywhere else.

The fly is fond of the foods we eat. When they are cooking on the stove, it smells them from afar; and, if a way is open, it will come in through a window, or descend through the chimney of the fireplace to get a taste for itself.

The fly has a peculiar appetite. It is fond alike of the daintiest foods and the most filthy ones. It is a continuous eater. It is always hungry. But its stomach will not stretch to admit everything it craves, so often it must eject one meal before it can take another. Perhaps a fly that has been feasting in a filthy cuspidor wants a taste of your pudding. It will stand on the pudding for a second and spit up some of its last meal to make more room so that it may partake with you of the tempting pudding. What the fly spits up is too tiny for your eyes to see; and you might eat, along with the rest of your meal, some of the germs which cause tuberculosis or some other dread disease. The house fly has no teeth; so when it wants to eat cake or other solid food, it must first pour out enough saliva to dissolve it, then lap it up. Should you like to have a visitor of this sort dining with you at any meal?

The fly does not care to remain indoors. If allowed to do so, it prefers to play a sportive game with its fellows, back and forth from filth to foods, the whole day long. Milk is one food of which it is very fond. It smells it on the baby's bottle, and helps itself to a drink. In exchange, it may leave for the baby some germs that, if swallowed, will make him ill.

Sometimes the fly, in its greed, falls into the pitcher, pan, or bottle of milk and is drowned. Then it is necessary that the milk be thrown away. People pay so much for milk that this seems a waste; but when the fly falls in, some of the bacteria from its body are washed off into the milk. There may be hundreds of bacteria on the fly, and many, no doubt, are dangerous disease germs. In milk, bacteria grow faster than almost anywhere else, and a few from the body of one fly may develop to a million in a short time. So it is never quite safe to use milk, or any other liquid, in which a fly has drowned.

THIS FLY COULD CARRY 50,000 OR MORE GERMS OF TYPHOID FEVER AND DEPOSIT THEM ON FOOD OVER WHICH IT MIGHT CRAWL. WOULD YOU LIKE TO EAT SUCH FOOD?

The bacteria a fly carries are likely to be of the most deadly sort. He is such a lover of rotting filth that he is ever seeking it from garbage heaps, pigsties, barnyards, outhouse vaults, cesspools, and wherever else it can be found. In some of these places he will very likely come in contact with disease germs. Discharges from the bodies of sick people are usually full of disease germs. People who care for the sick and those who are themselves ill are often very careless about throwing these discharges upon the soil, and about spitting upon the sidewalks or ground, so a fly has easy access to many kinds of germs. Then, if he happens to crawl upon food, or

Flies spread disease

dishes, or vessels used for drinking, or anything which goes to the mouth, he may leave germs enough to start any one of a number of serious diseases.

A man who makes a study of bacteria (Dr. William H. Parks) found that just one fly that had been feeding upon stuff in which there were typhoid fever germs left a trail of 30,000 typhoid bacteria as it walked over a plate of gelatin. It would have been the same, of course, if it had walked upon food.

A FLY, WALKING OVER A PLATE OF GELATIN OR ANY KIND OF FOOD, CAN DEPOSIT AS MANY AS 30,000 TYPHOID BACTERIA.

Another investigator who trapped flies along the river front in New York City, at points where filth and sewage empty into it, found the germs of typhoid and other diseases on the feet and wings of nearly all the flies he caught.

When a large army of men live together in camp, it often occurs that some of them become ill with typhoid. It used to be thought that typhoid bacteria were chiefly spread through the use of bad water or milk or other foods, but now it is well known that these germs are even more often scattered by flies. At one time, in the Spanish-American War, there were 107,973 soldiers quartered in military camps. Of these, 20,738 caught typhoid fever, with great loss of life. An investigation proved that the disease was not due to polluted water nor to bad food so much as to flies.

In the Japanese and Russian War, with over a million Japanese soldiers in camp, there were only two hundred ninety-nine deaths from typhoid; and in the great World War there were practically no deaths from typhoid among the American soldiers because of cleanliness and vaccination.

Nearly 50,000 babies die every summer from bowel trouble, the germs of which are probably brought to them in some way by flies. Oftentimes when the baby lies asleep, flies crawl over his hands and face, leaving flyspecks and germs which later may get into his mouth. Flies swarm around his bottle and about his food and dishes, leaving behind the seeds of death. Again, flies go from sick to well persons, taking along disease germs. Boys and girls who have babies in their homes can do much to keep them well by watching to see that they are screened while taking their naps, if there are any flies around. Of course, flies should never be allowed to get on the baby's food or his dishes.

Wherever flies exist, it should be a household law that all foods, cooked or uncooked, should be kept carefully covered.

Precautions to be taken against flies

I am sure you will think it is neither safe nor pleasant to eat food over which flies have swarmed. This rule needs to be applied also to all foodstuffs offered for sale, especially to fruits, greens for salads, and such articles as are eaten raw. If produce merchants, meat sellers, milk dealers, bakers, and others who handle food in your town do not do this, can you think of some good way to make them do it?

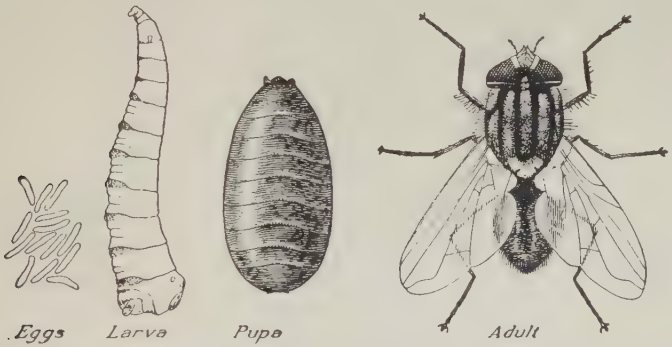
Feeding on filth, the fly also eats many bacteria. Most of these pass through its body unharmed and are deposited in flyspecks. Dr. Koch, a German scientist, found the living bacteria of tuberculosis in flyspecks on a chandelier in a house where a man having that disease had lived.

In the following three ways a fly may distribute bacteria:

1. By carrying them on its wings, mouth, legs, and feet.
2. By having them on its body when drowned or when crushed on anything likely to get to a person's mouth.
3. By flyspecks.

The fly hatches from an egg, which is often laid in stable filth. When this filth is not at hand, the fly will lay her eggs in any wet, rotting stuff she can find. She finds it by smell. She is especially keen in finding moist garbage, street sweepings, waste from the slaughterhouses, pig wallows, the waste from human bodies, dead animals, decaying vegetables, meat, cheese, fish, rotting straw, leaves, grass, heaps, and even old rags and papers on the dump pile.

Flies are bred in filth



YOU SEE FROM THIS PICTURE HOW THE FLY GETS ITS START IN LIFE AND HOW IT DEVELOPS. CAN YOU TELL HOW BEST TO PREVENT NEW FLIES FROM COMING INTO THE WORLD?

The fly must have three things, — filth, warmth, and moisture, — or else her eggs will not hatch. In winter and in very cool weather flies are not very common, because there is not warmth enough to hatch the eggs.

The fly usually lives for about three months. Most flies die at the approach of cold weather. A few young mother flies

live in hiding during the winter season. When spring arrives, they come out and begin to feed and to lay eggs for the summer supply of flies.

A single fly lays from 120 to 150 eggs at one time. In warm weather, it takes less than a day for these eggs to hatch into little white wormlike creatures, commonly called *maggots*. Dr. Howard says that in a climate like that of Washington, D. C., twelve generations of flies are born in a single summer. He has also made a very interesting calculation which shows that, since one fly lays so many batches of eggs, and so many eggs in each batch, if every egg hatched and all the flies developed, and each mother fly in turn laid eggs, and there was nothing to hinder a similar multiplication of flies through the twelve generations, — at the close of the summer the descendants from a single fly might number 1,096,181,249,310,720,000,000,000,000. Remember that one fly can carry more than a million bacteria.

How to get rid of flies

The very best way to get rid of flies is not to give them a chance to breed. If one lives in the country, with no neighbors nearby, he can, if he chooses, easily keep free from flies. In cities, villages, and towns it is more difficult to do this unless all the people are willing to help. It requires a great deal of care to keep the houses, yards, barns, factories, and streets, and all the alleys, byways, and dump piles as clean as they need to be to prevent flies from developing. If there are any careless citizens, flies enough may breed on their premises to bring harm to everybody in the town.

The things to be done to keep flies from breeding are: (1) to catch the winter flies as soon as they come out of hiding and before they have time to lay eggs; (2) to make things so clean everywhere that there will be no filth around in which a fly can lay its eggs. Flies cannot hatch in a dry place. Neither can they hatch in clean places. If we can keep everything about us

clean and can persuade our neighbors to do the same, we can get rid of flies permanently.

Wherever there are horses it is most important that the stable filth be kept in a screened pit or closet. If any flies develop there they will seek light and will collect about the screens; and they can then be easily killed by burning paper or in some other way. One good way is to have the filth removed once every week and spread upon distant ground to be plowed under. A shovelful of *chloride of lime* scattered every day over stable filth will destroy any maggots that may have hatched. A five per cent solution of *carbolic acid* sprinkled over the filth and all about the stable with a watering pot is another good way to keep flies from breeding. Its odor is so disagreeable to flies that they will not lay their eggs near it.

GARBAGE CANS SHOULD BE KEPT CLEAN.

If garbage cans are kept closely covered, and no smears or droppings of food are left about them; if they are emptied every day and well scrubbed before being used again; if vaults are treated at all times to a plentiful use of dry earth, and at least once each week to a thorough sprinkling with crude *petroleum;* if there is no moist litter left about anywhere, — flies will find little to attract them.

To make doubly sure, it is well to sprinkle chloride of lime or petroleum about the place where the garbage can is

kept. Do the same with every moist corner or thing about the place.

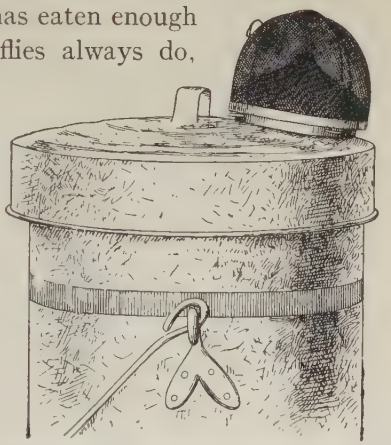
The fly is not a very good traveler. Unless borne by the wind or carried on wagons or trains, it rarely goes far from its birthplace. So, if we find flies coming to our homes, we may presume there is some place nearby which furnishes them with a good breeding place. If we are wise, we shall find this place and clean it up as soon as possible.

But if flies do get indoors, one should destroy them in the house. To drive them outdoors may do no good; they will probably come back and bring other flies with them.

The fly is a thirsty creature and often seeks drink. If we put two teaspoonfuls of *formaldehyde* and one half cupful each of milk and water together, we may make a good fly destroyer. Place a little of this mixture in saucers near windows and places where flies sport. It is a good plan, also, to put a small piece of bread in the center of the dish for the flies to light on. A still better plan is to fill a milk bottle, in the edge of which a small nick is made, with a two per cent solution of formaldehyde. Instead of putting a stopper over the bottle, hold a saucer close against its mouth and quickly invert it. Stand it thus on a shelf in a shady corner near bright sunshine, or on the window sill — any place that flies frequent. As only a small amount of the liquid can flow into the saucer at a time, it will last for a long period.

If flies are numerous in the neighborhood, the number likely to get indoors may be lessened by keeping doors, windows, and fireplaces carefully screened. This, of course, will keep out some fresh air. One observing lad recently asked, "Why not put the *flies* in jail, and let ourselves out?" This question was such an apt one that it led to the making of a kind of outdoor flytrap to be attached to garbage cans and to be applied

to other feeding and breeding places to catch flies before they get into the house. This is certainly a good, safe, and cleanly way, if there are flies to catch. This is how it is done. The fly is permitted to follow its bent and seek inside the trap the food which it smells. When it has eaten enough and flies toward the light, as flies always do, it finds itself in a trap. If one were to attach such a trap to the screen on the inside of a stable pit, it would catch all flies as they hatch. Another fitted to the outside would trap flies that are seeking to get in to lay eggs.



FLIES SHOULD BE PUT IN JAIL AS SOON AS THEY BEGIN TO APPEAR IN SPRING. HERE IS A PICTURE OF A GOOD FLY JAIL. THE FLIES GO INTO IT OF THEIR OWN ACCORD.

To catch winter flies, to deprive flies of breeding places, to kill the larvæ, to catch young flies before their eggs are laid, are some of the ways in which we can fight flies.

REMEMBER: One fly with its load of bacteria can start disease in scores of homes. During the Spanish-American War, only 250 of our soldiers were killed by bullets, but 5000 were killed by disease carried by flies. In every way possible, we must keep them from breeding and from getting into our homes.

HEALTH PROBLEMS

1. Why can a fly walk on the ceiling as well as on the floor? Make a drawing of its feet to show how they are constructed so that they can cling to any object in any position.

2. If you live in a town or city, try to find out what places the flies like best to visit, and see if you can learn the reason for this.

3. It is said that a fly can carry 6,600,000 bacteria. If you should place all these together, how much would they weigh, do you suppose? How big a heap would they make, do you think?

4. If you let them walk over a table freely, what dishes will flies hunt out especially?

5. If flies are drawn to places because of certain odors, how could you keep them from being drawn to those places?

6. Are there any places or things about your school buildings which are especially attractive to flies?

7. Look carefully about your house and outbuildings, if you have any, and try to find out what there is that might make good food for flies. Are there any good breeding places for flies around your house?

8. Ask the health officer in your city whether there has ever been an epidemic of any kind caused by the flies. If there has been, find out all you can about it and tell the class. How could it have been avoided?

9. Visit a fruit stall, a meat shop, and a bakery in your town or city, and observe whether the food is covered with flies. Does the merchant take any pains to protect his fruit from flies?

10. Have you noticed that house flies live all winter in your house? Where do they hide? Is there any way to exterminate them?

11. Are there any stables near where you live? If so, observe whether the flies are thicker there than they are in any other place. Explain.

12. If you can, get a little sample of *chloride of lime* at your house and show it to the class.

13. Try to get a little *formaldehyde* and bring it to class. See if the class can tell why this should be a good fly destroyer.

14. Are the windows of your schoolroom screened? Are they screened in your home? If not, what do you think should be done about it?

Review Questions

1. Describe the main parts of the body of the house fly. Tell especially about its feet.

2. Why does the fly gather so much matter when it walks through any sticky stuff?

3. How many germs can a fly carry?

4. What happens when a fly is covered with filth, and it walks over food or drops into milk?

5. Of what sorts of food is the fly fond?
6. How is it guided to find its food?
7. Why are the germs which it carries likely to be harmful?
8. Why are flies likely to be dangerous to babies?
9. What should be done with a pitcher or pan of milk into which a fly has fallen? Why?
10. What did Doctor Parks find about the number of typhoid bacteria carried by one fly?
11. What was shown by the fly that walked over a number of culture plates?
12. If a baby is trying to sleep where there are flies, what usually happens? How can you prevent this?
13. What should be a household law wherever there are flies?
14. In what three ways may flies distribute bacteria?
15. What is the form of the young fly?
16. What name is given to the young?
17. How can you destroy the maggots which may become flies?
18. How long does it take the fly to become full grown? How long does it live?
19. What is the best way to get rid of flies?
20. Can one person do much toward getting rid of flies unless his neighbors help him?
21. What breeding places do flies prefer?
22. What can you use to destroy flies, or to drive them away?
23. Tell how people should keep their premises in order to discourage flies from visiting them.
24. Why is it necessary to keep one's windows and doors carefully screened?

CHAPTER XXIII

A Disease Carrier — the Mosquito

In the preceding chapter, we saw how much disease and misery are spread among all sorts of people by the little house fly. But another member of the insect family, very common in all climates, and known as the *mosquito*, has a bad record, almost if not quite equal to that of the house fly, as a carrier of disease germs. It does not carry the kinds of microbes that a fly does, but it spreads disease just as readily in another way. While there are some mosquitoes that distribute no microbes, nevertheless many of them carry the germs of *malaria*, and still others those of *yellow fever*. It is quite probable that the spread of other diseases common in warm countries is also due to mosquitoes.

The mosquito spreads disease

One must swallow some of the bacteria the fly carries in order that they may have a chance to work havoc in the body. But microbes carried by the mosquito must get into the blood directly in order to do any harm. The mosquito has a long, slender, sucking mouth. To the naked eye, it looks quite like a humming bird's beak. But when we come to examine it, we find it is really a sheath that covers six separate mouth parts, — lances with which to pierce, tubes, saws, and such devices.

The female mosquito has the stronger mouth parts, and it is she that does most of the harm to human beings. When the mosquito bites, she puts all six mouths to the skin at one time. The sheath which is used as a guide goes only to the edge of the skin. Then she punctures the skin, and draws up blood through

one tube, and at the same time pours out saliva through another tube. Now, it is in her saliva that the mosquito carries the germs which cause malaria. When she bores the skin for a drink of warm blood, some of her saliva gets into the wound she makes; and then, if the saliva has in it the right sort of microbes, they enter the blood of the person bitten and grow and multiply until within a few days he may become ill with malaria.

Fortunately for many of us, the mosquitoes that carry malaria germs do not always have the germ in its most dangerous form with them. The microbe that causes malaria is one of the very tiniest forms of animal life. It is generally spoken of as a *parasite*. In the process of growing, it passes through a great many changes. It starts out in the blood of a person sick with malaria, but to complete its full round of life it must also spend a time in the stomach of a certain kind of mosquito, with the queer name *Anopheles* (A-nŏf′-e-lēz). This is the only kind of mosquito that will answer the purpose. The microbe would be digested if it got into the stomach of any other kind of mosquito.

WHEN YOU NOTE HOW THE MOUTH PARTS OF THE FEMALE ANOPHELES MOSQUITO ARE CONSTRUCTED YOU CAN SEE HOW SHE CAN PUT THE GERMS OF MALARIA INTO THE BLOOD OF ANYONE FROM WHOM SHE TRIES TO GET A DRINK.

If the Anopheles has not first bitten some one who has malaria, she will have no parasites in her saliva, and so she will be harmless. It takes several days (from seven to fourteen) for the microbes to develop in her body. But after the parasites have dwelt for a certain time in the mosquito's stomach, the next time the insect draws human blood, it may convey to even the most healthy individual the microbes of malaria.

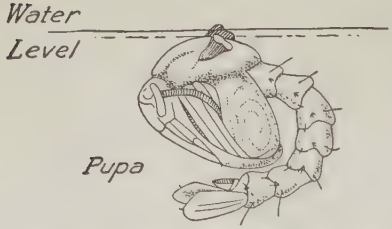
The variety of mosquito which we see most frequently in northern climates is the *Culex*. This one carries no malaria

parasites. Although it may annoy us greatly, its bite is not very harmful.

The life period of a mosquito is usually from four to six weeks. A few may survive the cold of winter until spring. Then, having laid their eggs, they die. As with the house fly, the eggs hatch *larvæ*, which change into *pupæ*, and the pupæ develop into mosquitoes. The mosquito's eggs are always laid in still or stagnant water. It may be a large or a small body of water. A very little water will do; but there must be enough of it to cover the larvæ when the eggs hatch, or else they will die. It makes little difference to the mosquito where she finds the water, — whether in the rain barrel, in an old tin can, in a watering trough, in a drain, in a stagnant pond, or in any standing puddle. Marshes and swamps have so many depressions which hold water that she seldom fails to find good places there in which to lay eggs. She likes, too, the edges of slow streams with grassy margins through which fish cannot penetrate. Water held in sagging places in the eave troughs, old pails at the back door, even cow tracks in the moist pasture suit her very well.

How mosquitoes are bred

THE MOSQUITO'S EGGS HATCH INTO LARVÆ.

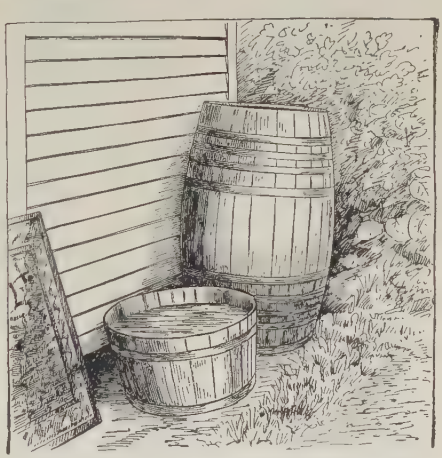


THE LARVÆ CHANGE INTO PUPÆ, AND THE PUPÆ DEVELOP INTO MOSQUITOES.

The eggs are laid upon the surface of the water. Some are laid singly, and others are laid in a mass. The Culex arranges her eggs in a raftlike mass which, being pointed at both ends, looks quite like a little gray boat afloat on the water. This boat

of eggs may contain from 150 to 400 eggs, stuck together and standing on end, side by side. It only takes twelve hours for these eggs to hatch. The young larva cuts a hole in the lower end of its egg and drops into the water beneath. Then it begins to wriggle through the water, and goes so fast you can hardly see it unless the water happens to be quiet. For this reason the larva is called a *wriggler*.

Now, if you should have a chance to dip up a glassful of water in which there are wrigglers, you would notice that they keep coming to the surface and poking the ends of their bodies through the water. This is the way they get air to breathe. They feed on what they find in the water, but they must come to the top for air.



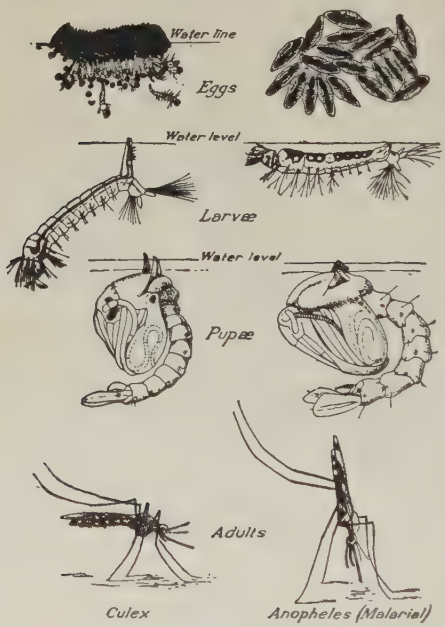
THE MOSQUITO THAT CARRIES MALARIA GERMS CHOOSES THE RAIN BARREL AS A FAVORITE PLACE IN WHICH TO LAY ITS EGGS.

The wriggler grows very fast; and in a week in warm weather it changes to a curious club-shaped pupa. It looks quite like a little tadpole. It never eats as a pupa; and, unless disturbed, it will remain quietly floating on the surface of the water for two or three days. Then its skin cracks open down the middle of the back, and a full-grown mosquito crawls out. Thus, you see, it takes about ten days, in warm weather, for an egg to become a full-grown insect. It takes longer in cold weather.

The Anopheles mosquito lays her eggs not singly but in groups. Both wriggler and pupa, unless disturbed, remain at the surface

of the water, holding their bodies straight with it. It takes this kind of mosquito nearly a month to develop from egg to insect. The Anopheles chooses a different sort of place from the Culex in which to lay its eggs. It breeds more commonly in shallow pools, ponds, canals, and bodies of water that are large enough to be permanent. On this account, it is called a *country* mosquito; and the Culex, which will breed in anything that holds a little water, is termed the *city* mosquito.

The Anopheles and the Culex mosquitoes



WHEN YOU SEE HOW THE MOSQUITO STARTS OUT IN LIFE, AND HOW IT DEVELOPS INTO A MOSQUITO, YOU CAN TELL WHAT MUST BE DONE IN ORDER TO PREVENT NEW MOSQUITOES FROM COMING INTO THE WORLD.

Mosquitoes never fly far. Sometimes they are borne some distance by the wind; but the Anopheles has a habit of clinging to the grass and weeds when the wind blows. As they fly about, the Culex and Anopheles appear quite alike; but if you should chance to see them when they are resting, you could tell them apart, for the Anopheles always stands out at an angle from the surface it is resting upon, as you see in the picture. Every other kind of mosquito lies with its body in a straight line with the thing on which it rests.

There are other ways in which you can tell them apart. The Culex has wings of a yellowish brown color all over; the Anopheles has darker bands, or spots, on its wings. The Anopheles, too, sings its song in a much lower key than the Culex. Their manner of attack is also different. The Culex moves slowly, buzzing about for a time before biting; but the Anopheles goes at her work with a rush, and often bites a person before one realizes that a mosquito is about. The Anopheles is frequently seen in houses, clinging to walls and ceilings in the daytime. It seems inclined to sleep during the day and to work at night. The Culex does not care to remain indoors.

How we know that mosquitoes spread malaria

It is only within a few years that much has been known about the part the mosquito takes in spreading malaria. It used to be thought that living upon marshy lowlands and going out in the dampness and fogs in the early morning gave people malaria. Then someone happened to think that mosquitoes are thick in swamps and marshes, and began to suspect that they might have something to do with the disease. Scientists set about to make a study of the subject, and they found out much that led them to believe that the mosquito is the cause of malaria. They put the matter to a hard test to make quite sure. The place chosen was a great, marshy plain, lying close to the city of Rome, Italy. It was said that no person ever spent a night in this marsh without getting malaria. Sometimes poor Italians who wanted homes made huts for themselves on the tops of ancient tombs, many of which lie along a broad road which passed through this marshy country, or *Campagna*, as it is called. Perched on the top of these old ruins, twenty or thirty feet above the ground, these poor people lived quite free from malaria. Can you think why? It was not very convenient to live so high up, because they had to climb ladders to get indoors; but it was safest.

To make the test, two Englishmen from London (Drs. Sanborn and Low) and an Italian gentleman undertook with their servants to live from June until October, the season when malaria is most common, in the very worst part of the Campagna. They built a five-room cottage on the banks of a canal that swarmed with Anopheles mosquitoes. But they made this cottage mosquito proof by putting screens on all the doors and windows. They took care to be inside the cottage by sundown. It seems that these mosquitoes, like wild beasts, prowl about mostly during the nighttime for their prey. When October came, not one of these persons had shown the least sign of malaria. Another Englishman (Dr. Elliott) went out to Africa some time before this to study the cause of malaria in the swampy regions of that country. He and his helpers spent several months living in the marshes. They took care to protect themselves by mosquito nets at night. Not one suffered from the disease.

The malaria test

To make the proof still more certain, an English physician made a test upon his son. He allowed him to be bitten by an Anopheles that had been fed malaria parasites. There was no other way in which the boy had been exposed to malaria; but in two weeks' time he became sick with it. The Japanese government also wanted a positive proof, so it sent a number of soldiers into a district where there was much malaria. The soldiers were divided into two squads. One of these lived in screened tents, with mosquito netting around their bunks, and they were not allowed to go out after sundown. The second squad was unprotected. Many of these latter soldiers got sick with malaria, but not one of the others had the disease. So now we know that malaria does not come from swamps and ditches, but from the mosquitoes that feed in these places.

There are a good many kinds of mosquitoes besides the Culex

and the Anopheles. Another sort, that goes by the odd name of *Stegomyia*, carries the parasite of yellow fever, a disease more to be dreaded than malaria. Yellow fever is common in tropical countries. In some places in Mexico, Central and South America, and the West Indies, it used to cause great loss of life. At certain times during the warm season it has been widespread in some of the southern parts of our country also. In one summer, nearly 16,000 persons died of it in the states of Louisiana, Mississippi, and Alabama. People greatly feared the disease, as well they might. It was supposed to be *catching*, that is, that one might get it from a sick person, or by handling his clothing or bedding. The weather, too, was thought to have something to do with it. Whenever yellow fever broke out, everybody who could go fled to some cooler place to get away from it. Those who were unable to leave home longed and prayed for frosts; for it had been observed that when the weather became cold enough for frosts the disease died out. In places where there were never any frosts, cases of yellow fever were likely to occur at any time of the year.

The Stegomyia spreads yellow fever

Some years ago men of science began to study the cause of this disease; they believed if the cause could be discovered, a way could be found to prevent it. Finally, at the time of the Spanish War in Cuba, some experts belonging to the United States army, with Dr. Walter Reed at their head, were appointed to investigate the matter. The place chosen for the study was one where there were already many people ill with the fever, and since no one knew just what to do there seemed no way to prevent its spread. You can imagine, can you not, that it took great courage on the part of these men to undertake to battle with such a deadly foe. But they belonged to the army of true soldiers who are ready to sacrifice themselves and work for the good of

others. They had to risk their own lives in this effort to learn how to save other lives.

It had already been suspected that the disease was carried from the sick to the well by mosquitoes. There was no way to make sure of this but to note the effects of the bite of insects known to have sucked the blood of yellow fever victims. Some one then must stand the test. Now these brave men, who knew so well the peril of life which this meant, would not ask of others what they were not willing themselves to do, and so they quietly resolved to be the ones to stand the test. Before they were quite ready to begin, Dr. Reed was called to Washington for a time. The first one bitten was Dr. Carroll. Within a few days he became severely ill with the fever, but afterward recovered. Dr. Lazear, at his duties in the yellow fever hospitals, saw a mosquito settle on his hand. He allowed it to remain there, drinking its fill from his body. In less than a week he came down with the fever in its very worst form, from which he died, a brave martyr to the cause of humanity. So long as he was able to think he was writing out the record of his experiments to help along the work for which he laid down his life.

It was now plain that the Stegomyia mosquito was a carrier of yellow fever; however, as yet it was not certain that the mosquito was the only cause of the disease. Dr. Reed upon his return set about to find this out.

In a camp where the sick soldiers were cared for, about a mile from the city of Quemados, a small house was built. Every door and window was screened so that not a single mosquito could make its entrance from the outside. Here a test was made to see if yellow fever could be brought on by contact with anything worn or used by the sick. Here seven men spent twenty nights sleeping under bedclothing brought from sick rooms, and even wearing clothing which yellow fever patients had worn

and soiled, without their having been washed, things so foul-smelling as to be almost beyond endurance; neither were any pains taken to keep the house clean and sanitary. Notwithstanding all this, not a single man caught yellow fever, a fact that made plain that the fever was not catching, nor the result of filth.

It was not yet plain just how long a time must pass after a mosquito drinks yellow fever blood before it can give the disease to its victims. To learn this required further tests. A call was made for volunteers, and a money reward offered for their services.

The first to respond to this call were two young soldiers from Ohio (John R. Kissinger and John J. Moran). To make sure that they understood what was required, the great risk of such an experiment was fully explained to them. They were likewise told of the $200 reward each could claim. When they had heard all that was said, each declared himself ready to undertake the test, but that *on no account would he accept pay for so doing.*

In a room where there were kept several Stegomyia mosquitoes known to have yellow fever poison, these young heroes, each by himself, faced the test. On three different occasions each spent a time in this room allowing mosquitoes to bite him. As was expected, both became very ill with the fever, but both recovered.

In all twenty-two persons risked their lives with heroic courage to find the cause of the fearsome fever, with the result that proof beyond any question pointed solely to the Stegomyia mosquito.

Then it was plain to everyone that in order to put a stop to yellow fever it was necessary to get rid of the mosquito; and the people of Cuba set about this with a will. The first thing they did was to hunt for every spot where mosquitoes might lay eggs and to destroy such breeding places. One method of doing this was to coat the surface of all standing water with oil. Neither larvæ nor pupæ

How to get rid of the mosquito

can get through the oil film on the water to get air. If they cannot come to the surface, they soon drown. The grown mosquito will not lay eggs on oil; and so where all standing water is kept covered with oil, mosquitoes soon die out. Another thing they did was to screen the sick from mosquitoes. The Stegomyia can only get yellow fever parasites to convey to other people by sucking the blood of a person ill with the disease or of one who has died from it. So if they can never get to a sick person, they will have no yellow fever germs, and their bite will be harmless.

Within ninety days after Dr. Reed's work was finished, yellow fever for the first time during the mosquito season was entirely wiped out of the city of Havana. Since that time there has been no spread of that disease in the island of Cuba.

Although such a tiny insect, the mosquito was one of the greatest obstacles in the way of building the great Panama Canal. Both the Stegomyia and the Anopheles abound in the Canal Zone. At times there were so many cases of malaria and yellow fever it was quite impossible to keep a sufficient force of men to carry on the work. When, in 1904, the Americans took possession of the Isthmus, they put into practice the measures which had already proved successful in Cuba, with the result that within a year yellow fever was banished from the Isthmus.

In 1906 yellow fever broke out in New Orleans. Before the inhabitants were aware of it, the disease had spread to every part of the city. Then the people were aroused, and they screened the seventy thousand cisterns in the city and poured kerosene over every standing pool of water. Houses, too, were fumigated in order to kill any stray mosquitoes that might have flown in, and thus the disease was conquered.

The Stegomyia mosquito may be detected by the white bands

on her legs and white marks on the upper part of her body. If there is no yellow fever about, she can do no more harm than any other mosquito. Of course, no one can tell beforehand whether or not a mosquito has a load of parasites. So the better way is to take no risks with them. The safe course is to get rid of all of them.

It is difficult to destroy full-grown mosquitoes. But a smudge or dense smoke will have a good effect in driving them away from any place. If they are in a house, the following plan may be tried: Buy some *pyrethrum* powder at the drug store. Heap it up into a little pyramid and light it at the top. As it burns, its odor will stupefy the insects, and they will drop to the floor. It does not kill them, however, so they must be swept up and burned. A pound of this powder to one thousand cubic feet of space will be enough. If the mosquito one is trying to destroy is the *Stegomyia*, and dangerous, there would be greater safety in burning sulphur (two pounds to a thousand cubic feet of space). Strong sulphur fumes will soon kill a mosquito, as they will also kill any other living thing.

The proper thing to do is to deprive the mosquitoes of a place on which to lay their eggs. Some of the ways in which we can do this are to:

1. Clean out all places where water stands.
2. Turn over every pail or tub that may hold water.
3. Pick up old tin cans and bottles and put them where rain cannot fill them.
4. Screen rain barrels and cisterns so that the mosquitoes cannot reach the water to lay eggs.
5. Keep the roof gutters clean, and be sure that they dry out after rains.
6. Screen the wash water, if it is left standing over night.
7. If there is a drinking pan for birds or animals, change the water in it every day.

8. Fill all holes and hollows where the water stands on the ground. A large place like a swamp must be drained and filled up.

9. Coat ponds, pools, drains, cesspools, and any standing water with a film of oil.

Fish eat mosquito larvæ. A few goldfish, minnows, or tadpoles in a pool will soon rid it of larvæ. Swallows and martins destroy mosquitoes. Would it not be wise to encourage these little birds to live near our homes and help us to destroy these insect pests? Bats also destroy them.

Whenever mosquitoes are plentiful, doors and windows need to be well screened in order to make a house safe. It is a good plan to keep the screens lightly painted with kerosene. Why? Another means of protection is a canopy of mosquito netting to cover the bed in which one sleeps. This needs to be of ample size, so that it can be folded under the mattress at every side. A good way to do is to suspend it from a pulley in the ceiling above the bed.

Remember: The pain which the sting of the mosquito gives us is likely not to be the worst part of its bite. The mosquito is a carrier of dreaded diseases, and it should be prevented from breeding anywhere on one's premises, and it should also be destroyed if it manages to get into the house in any way. Carelessness in regard to this matter may cost one a great deal in time, money, and health.

Health Problems

1. Which is the more common in the community in which you live, the house fly or the mosquito? How do you explain this?

2. Does your skin swell up and itch when you are bitten by a mosquito? If so, explain why.

3. What is the meaning of a *parasite?* Mention several kinds of parasites.

4. What is the difference between *bacteria* and *microbes?*

5. If you can possibly do so, find a larva of a house fly or a mosquito, and note the changes it passes through as it develops.

6. Where are the mosquitoes thickest in the community in which you live? Explain.

7. Do you know in what section of our country mosquitoes are most common? Explain why.

8. Make a list of the places or things around your home which make good breeding places for mosquitoes.

9. Find some of the eggs of a Culex and also a "wriggler" or two, and show them to the class. Where will you look for these?

10. Are there both Culex and Anopheles mosquitoes where you live? Can you tell them apart? How?

Review Questions

1. What insect is the cause of almost as much harm as the house fly?

2. Does it carry the same kinds of microbes as the fly?

3. How does the mosquito convey its microbes to people?

4. What are the chief diseases which the mosquito carries?

5. Describe the mouth of the mosquito, mentioning the parts and their uses.

6. Describe the way in which a mosquito draws blood from a person.

7. How do the microbes escape from the mosquito into the blood of a person who has been bitten?

8. How does the Anopheles get the parasite of malaria which it puts into the blood of the person whom it bites?

9. What is the life period of a mosquito?

10. When does it lay its eggs?

11. What changes are passed through by the larva of the mosquito before it becomes full grown?

12. In what kind of water does the mosquito lay its eggs?

13. What places about the house or the barn or the yard are likely to become breeding places for the mosquito?

14. What is the difference between a Culex and an Anopheles?

15. In what form does the Culex arrange her eggs?

16. How long does it take the eggs to hatch?

17. How do the "wrigglers" get the air which they need in order to live?

18. Does the Anopheles lay its eggs in the same sort of places as the Culex?

19. After it has bitten you, can you tell without seeing it which one of these mosquitoes has paid you a visit?

20. Why did people once think that malaria came from marshy lowlands and swampy places?

21. How has it been proved that the mosquito causes malaria?

22. What other deadly disease is spread by the mosquito?

23. Why did people formerly think yellow fever was catching?

24. What study was made by the United States government which showed that the mosquito was the means of spreading yellow fever?

25. Describe another test which was made to prove the same thing. What was the result of these tests?

26. How did Cuba get rid of the mosquito which was the cause of yellow fever?

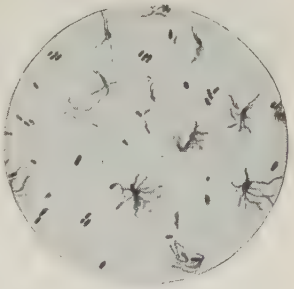
27. What is a good way to destroy mosquitoes if they get into one's house?

CHAPTER XXIV

Protecting the Body's Health

Nearly all dangerous bacteria come from the bodies of the sick. They get into the air and into the water and food in various ways. If one then breathes the air or drinks the water or eats the food that contains bacteria, he, too, may become sick with the kind of disease they cause. Diphtheria, typhoid fever, smallpox, measles, whooping cough, infantile paralysis, pneumonia, tuberculosis, cholera, and grippe are the names of some of these diseases. They are all "catching" diseases. Each is produced by a special sort of germ. The kind that causes one disease will not make a person sick with any other disease.

Germs

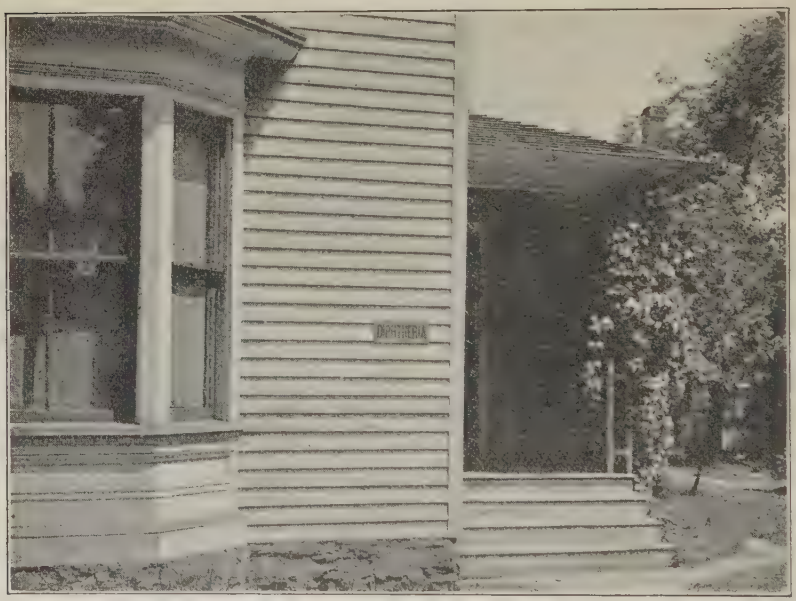


Each catching disease is caused by a special kind of germ.

All these diseases are dangerous, and they should be avoided as one would avoid a lion or any other ferocious animal. When anyone is sick with a catching disease, all persons who are not needed to give him proper care should keep away from him.

Most towns and cities have one or more persons, called *health officers*, whose business it is to try to prevent these catching diseases. When anyone is ill with a dangerous disease like diphtheria, measles, scarlet fever, typhoid fever, or smallpox, the health officer puts a sign on the house. When people see that sign they know it to be a warning, and they should keep away.

A woman whose little daughter had scarlet fever did not want a sign put on her house, so she told no one what ailed the child. Other children came to the house. The little girl, not being very ill, was permitted to play with them. A few days afterward several of these children became very sick with scarlet fever.



NO ONE BUT A PHYSICIAN, NURSE, OR HEALTH OFFICER CAN EITHER ENTER OR LEAVE THIS HOUSE WHILE THE DIPHTHERIA PLACARD REMAINS ON IT. WHY?

It cost their parents much money to provide the care their illness required. They missed school and all the good times their playmates were having. One child lost his hearing as a result of his illness, and each one suffered to a greater or less degree. All for the lack of a card which would warn people that there was a dangerous disease in the house!

It is our duty to do all we can to protect others as well as ourselves from disease. When a case of catching disease occurs in a home or school, it should be promptly reported to the health officer. In many places there are laws which make it a crime not to do this. Is this the case in your town?

Scarlet fever, measles, whooping cough, mumps, and chicken pox are often called *children's diseases*. When once a child has recovered from one of these diseases, he rarely has it a second time.

Scarlet fever is the most dangerous disease of childhood. It is very likely so to weaken the body that other serious diseases follow it either at once or later in life. Injuries which result from it often last throughout the rest of the patient's life. The eyes or ears are often so seriously injured that partial or complete blindness or deafness is produced. Even mild cases are dangerous. One who has it must be given the best care. This is not always possible at the child's own home. In many places special hospitals are provided for the care of those ill with catching diseases. This is a boon to the sick, and likewise a means of protection for well persons.

Scarlet fever is spread by discharges from the throat and nose and by scales which fall from the skin. Generally it takes six weeks for the person to get so well that there is no danger of giving the disease to others. Even though the patient feels quite well, it may not be safe to allow him to mingle with his playmates, because he may still carry with him some living scarlet fever germs which might give rise to the disease in others. So a person who has had scarlet fever must wait until he is released by the health officer.

Scarlet fever germs may be carried from a sick to a well person on clothing, books, papers, and things worn or handled by the sick person; they may lodge, too, in the room where the sick

one has been kept. To prevent other cases these germs must be completely destroyed.

Measles is another dangerous disease against which the same precautions as with scarlet fever are necessary. It is communicated in a similar manner. It may leave behind it, also, a whole train of dread diseases.

It is very important that children should avoid every catching disease. A sore throat is likely to be the first bad feeling in the case of scarlet fever and some other serious diseases. It is wise to beware of any person with a sore throat.

Germs enter through the mouth

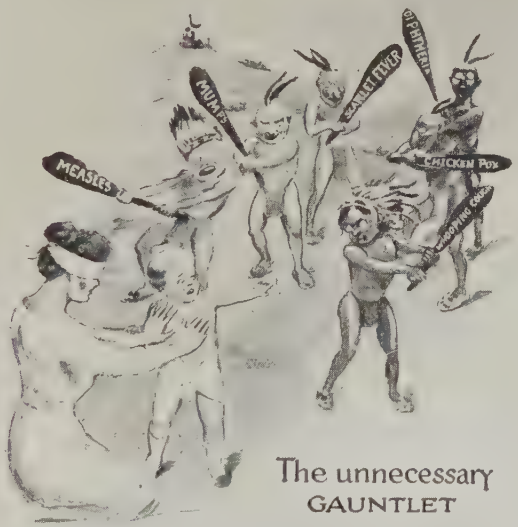
The mouth is the gateway through which many germs get into the body. Some germs leave the bodies of the sick through this same gateway. Do you think it a wise thing for people to kiss one another on the mouth? Do you think it right to allow all sorts of people to kiss a baby?

A sick man drinks from a public drinking cup. He may leave disease germs from his mouth on the rim of the cup. Then a little girl comes for a drink, and the germs get a fine chance to slip into her mouth while she is drinking.

If you are thirsty when at play, go to one of the bubble fountains from which you can drink without a cup. If necessary drink from the hand or make a cup from a piece of clean paper, but do not drink from a public cup or glass. Such cups must be dipped in boiling water every time they are used, to make them safe. The glasses at restaurants and soda fountains are often not cleansed sufficiently to make them safe. Should you always take your own drinking cup to school with you? Why?

Suppose that when you get to school you find that you have forgotten your pencil. Should you borrow one from a classmate? Suppose you borrow one from a pupil who has a habit of putting his pencil in his mouth, and suppose you have the same

COMMUNICABLE DISEASES



The unnecessary GAUNTLET

It is not necessary for children to have any of these diseases

They all pave the way for more serious troubles such as tuberculosis, deafness, blindness, kidney disease.

An epidemic is a disgrace to a community.

habit. What may be the result? Diphtheria and other germs have been found on pencils.

Think over this case: You go into a public library and sit down to read in the children's room. The first book you pick up has dirty thumb marks on the pages. There is a boy near you, wetting his thumb in his mouth every time he turns the pages. You say: "This is not a nice habit. It makes the book dirty." But is this the worst thing about the boy's dirty habit? Five thousand bacteria were found sticking to the leaf of a book from one thumb that had been wet with saliva. Might they pass from the book to your hands as you turn the leaves? What should one do in a case like this?

From door knobs, car rails, straps, and other things that everybody touches, you may gather disease germs on your hands. If you are in too much of a hurry to wash your hands before dinner, you may give the germs a good opportunity to pass into your mouth with your food. Is it well to keep the hands away from the mouth and not rub them over the face? Why? Sore eyes and pimples on the face may come from hands that have bacteria on them.

A man with disease germs in his mouth spits in the street. A little boy comes along and gathers up some of the germs along with the dirt which clings to his boots. When he goes home he does not stop to wipe his boots on the doormat. He goes into the sitting room, and some of the dirt on his boots is wiped off on the rug. His little sister is playing on the floor. The germs get on her hands; she puts her finger in her mouth and the germs go with it. What may be the result of this?

When people have certain diseases, they distribute disease germs wherever they go, unless they are very careful. A great many germs are scattered about by people spitting on the sidewalk or in public places. This is so dangerous that in some

towns and cities there are laws against spitting, and persons who are caught expectorating on the walk are fined or put in jail. In cars and public buildings you may often see the sign: "Don't spit." Is this a rule every one should obey even if there are no laws forbidding it?

A little sick girl was shut in the house away from all her playmates. It was not safe for them to visit her. One of her friends sent in her kitten to amuse and comfort the sick child. When the child was better, the kitten was sent home. After a few days her mistress noticed that kitty was not well. She petted and fondled the kitten. Soon the child herself was taken ill with the same disease that her little friend had. She herself had not been near the sick child. How did she catch the disease? We often hear cats sneezing, and see their eyes running just as ours do when we have a cold. Even when they are not sick themselves, they often carry disease germs in their fur. Is it a good thing to nurse and fondle cats? Do you always know where your pussy goes visiting when she is out of your house? Is it important not to run any risks?

Formerly no one knew that colds and influenza were catching, but now it is known that in sneezing and coughing a person with a cold sends out into the air around him little droplets of moisture full of germs which those near him may breathe in and so get the same disease. This is the case when one has influenza. Quite often children have these diseases and although they do not feel so well as usual they continue to go to school. What do you think is likely to happen to the other children?

Here is what did happen in a school I know about. It was at a time when influenza was very prevalent. There were over a thousand pupils who attended the school. On one floor this plan was carried out: As soon as a child in any room showed signs of influenza he was sent home, and at night that room

was cleansed in a way that left no germs behind. As a result, less than two dozen of the pupils on that floor took the disease. On the other floor no such care was taken and about two thirds of the children suffered with influenza.

Guarding against contagion

From one single case of a catching disease, if it is not well guarded, there may follow hundreds. Two boys I knew had whooping cough. They did not feel very sick. It seemed too bad for them to miss their lessons, and get behind in their classes, so their parents allowed them to go to school. Very soon nearly all the children in that school who had not already had it caught the disease. Should those boys have been kept at home? Why? Whooping cough kills 10,000 children in the United States every year. Those who do not die from it are likely to have their bodies so weakened by it that they will be unable to resist pneumonia and tuberculosis. Do you think any one having such a serious disease would be willing to be the cause of other people catching it?

If you stand on the dock when a steamer is leaving, you are sure to see a lot of waving handkerchiefs. People often signal to each other in this manner. If the handkerchiefs have been used, they will be likely to contain germs from the nose and mouth. Each wave of the handkerchief may send out into the air a little shower of disease germs. It is important to change one's handkerchiefs often, even when one is well. Why? Should one ever flourish a soiled handkerchief in the air? Sick persons should use paper handkerchiefs that can be burned. Why? The Japanese, who are very clean in their habits and very healthy people, always use paper handkerchiefs. The discharge from the nose when one has a cold very quickly makes a cloth handkerchief so moist that it is of no further use. A girl I once knew used to dry her handkerchiefs on the steam coils so that she could use them a second time. Do you think that is a safe

thing to do? Is it wise to wipe the eyes with a handkerchief that has been used for the nose? Those who care for babies frequently use their own handkerchief for the little ones. Do you think this a safe plan?

Probably the disease that kills more persons than any other is consumption, or tuberculosis. It is so common that in this country one person dies from it every three minutes. Tuberculosis most often affects the lungs, although it also occurs in other organs of the body. When the lungs are diseased, the sick person coughs, and sometimes raises much foul matter. This swarms with the germs that are the cause of the disease. If this falls upon the floor, carpet, or bedding, the germs get into the air of the house, and whoever breathes it may also get tuberculosis.

Tuberculosis, the deadly disease

TUBERCULOSIS GERMS

If the *sputum* (disease matter from the lungs) is discharged upon the ground or sidewalk, it is likely to be trodden under foot, and thus carried about, distributing germs in new places, or it may become dry and mingle with the dust which may be borne by the wind, scattering germs wherever the dust flies. A scientist found large numbers of tuberculosis germs on grapes that grew in a vineyard near a dusty highway. Tuberculosis germs are scattered, too, by the tiny droplets which are sprayed out into the air every time a sick person coughs or sneezes.

Whatever a person suffering from tuberculosis eats with or in any way uses about his mouth is sure to carry germs, unless it is thoroughly cleansed. As likely as not, too, when a sick person spits upon the floor or sidewalk, flies walking over the discharge may get it on their wings and feet, and so may carry some of the germs along to the next person or thing upon which they alight.

With all these ways of distributing the germs of tuberculosis, see how easy it is for a well person to get them from a sick one, if the latter is not most careful.

A wise program for the sick is: (1) To hold a cloth before the mouth when coughing. The cloth should be burned thereafter. (2) To spit into squares of soft cloth or paper napkins, using each but once and afterward burning it. (3) To use a pocket cuspidor or some vessel filled with disinfectant. (4) To use the same dishes at each meal, and to wash them separately from those used by other people. (5) To wash the hands often. (6) To avoid kissing.

Care in promptly destroying all germs that come from consumptive persons would save thousands of people every year from getting this disease. Careless people who are ill with tuberculosis are to be feared. Sometimes it happens that neither sick people nor their friends understand about the precautions needed to protect well people. So you see it is most important for everyone to know about this disease and how to prevent its spread. When tuberculosis germs are breathed into the lungs of a perfectly healthy person, they are likely soon to be killed by the wonderful white blood cells of which we have already learned. It is the one who is out of health or run down from one cause or another, such as lack of proper food, or of sleep, or of fresh air, who most often gets tuberculosis. The use of alcohol and tobacco, because they weaken the body, makes one very liable to catch tuberculosis if he breathes in the germs. The surest course to pursue in order to avoid getting tuberculosis is to practice health habits, and to keep the body so well and strong that it can resist disease. Mention the health habits that will protect the body from this disease.

Preventing tuberculosis

The tuberculosis germ has a good chance to gain a hold in

the body when a person is having a cold. It is wise, therefore, never to neglect a cold. Taken at the beginning, tuberculosis can be cured. Rest, good food, and outdoor air and sunshine are the four best ways to bring about a cure. Physicians say the best thing to do is to live out-of-doors in the open air and sunshine all the time. Why should this be good for a person sick with tuberculosis?

REMEMBER: One who has a cough for a long time ought to have an examination made. The health department in most cities will make an examination free of charge. It is very important for one who has tuberculosis germs to find it out as soon as possible so that he may take steps to be cured. He should find it out, too, so that he may protect those among whom he dwells, and may make himself a safe person with whom to associate.

HEALTH PROBLEMS

1. Place a piece of glass about four inches away from your mouth when you cough or talk loud, and notice whether anything appears on it. Explain.

2. Suppose your classmate has a "cold in his head," and sneezes often very near you. Are you in any danger?

3. Find out what the Board of Health or the physicians or the people in the place where you live are doing to get rid of some catching disease.

4. Has your school ever been closed on account of an "epidemic"? If so, what was it? Why was the school closed?

5. Suppose you knew of a family in which there was a case of scarlet fever, but the family would not tell physicians about it in order to avoid being "quarantined"? What would you do? Why?

6. Should every well person help the health officers as much as he can to prevent people from spitting on street cars, sidewalks, in public buildings, etc.? Why?

REVIEW QUESTIONS

1. From where do the bacteria that make one sick first come?
2. How are they carried from one body to another?

3. What are some of the diseases caused by bacteria?

4. What may happen to well children playing at the house of a child who has such a disease as scarlet fever?

5. What is the gateway through which many germs enter the body?

6. Is there danger in using a public drinking cup?

7. Is there danger in children's using the same lead pencil? In eating food without first washing the hands? In rubbing the eyes with the hands? In fondling cats?

8. Is there danger to pupils in school from a child who has a hard cough?

9. Is there danger from people's waving handkerchiefs about in the air?

10. What is the disease known as *tuberculosis?*

11. How is tuberculosis spread among the people?

12. What care should one who is suffering from tuberculosis take?

13. What do the white blood cells do to save one from tuberculosis and similar diseases?

14. How should one live in order to keep his white blood cells in good condition?

15. What kind of living may weaken one so that he cannot fight tuberculosis and other diseases?

16. How can one find out whether he has tuberculosis?

CHAPTER XXV

Common Accidents

All persons are liable to meet with accidents. To know what to do and how to do it, in case of accident, may sometime save a person's life. In most cases, the need for prompt action is so great that one should apply his own knowledge first, if no other aid is near and he knows the right thing to do, and then call an older person, a doctor if possible.

Last summer, while a crowd of boys were playing together in a field, one of them ran against a scythe, which had fallen from the limb of a tree where it had been hung; and it cut a long, deep gash in his leg. The wound bled very fast. As the boy was a long distance from home, he was in danger of bleeding to death. One of his companions, a lad of fourteen, pulled out his handkerchief, folded it crosswise, and tied a knot in the middle. He put into the knot a small pebble. Then he bound it as tightly around the leg as he could so that the knot came just *above the cut* but not *over* it. After tying the handkerchief, he passed a lead pencil underneath on the side opposite the first knot and twisted it round and round to make it tighter. This soon checked the bleeding.

How to make a wound stop bleeding

Some of the boys then made a "chair" with their hands, and carried their companion to the nearest house. A surgeon was summoned to mend the cut blood vessel. For the time being, the *tourniquet*, as it is called, made with the handkerchief, had

How to stop a wound from bleeding. Note that the knot is tied just above the cut, when an artery is cut, and that it is made very tight. Where should the knot be tied when a vein is cut?

stopped the bleeding. But it would not be safe to leave anything so tight on a leg for a long period, not over an hour at the most. Why?

A short time after this incident, one of a group of schoolboys, in a scramble to be first to get a ball with which they were playing a game on the school grounds, cut his arm badly on a barb of a wire fence. The blood flowed from the wound in a stream A playmate who had seen the treatment given to the boy who had cut his leg tried to stop the bleeding in the same way, but without success.

"Tie a handkerchief both *above* and *below* the cut," advised their teacher, who came out to see what was the matter.

This was done and the bleeding stopped.

"But I'm sure that's not the way it was done the other time," said the boy.

"True," replied his teacher, "but then an *artery* had been cut. This time it is a *vein*."

"Well! how is one going to tell which is which?" queried the boy.

"By just this," said his teacher: "*The blood from an artery is bright red, and comes in spurts with each heart beat. The blood from a vein is of a darker color, and flows in a steady stream.*"

ONE WAY TO STOP NOSEBLEED

In the first case, if nothing with which to make a bandage had been at hand, the bleeding might have been checked by placing both thumbs directly opposite each other *just above the cut, between it and the heart*, as in the picture, and *pressing hard*. The pressure must always be kept up until a surgeon arrives to give the injury attention.

Nosebleed may generally be stopped by holding the head erect, reaching both hands high above it and, at the same time, taking several deep breaths. Put a basin under the chin to receive the blood, or press the corner of a dry handkerchief into the bleeding nostril. If the bleeding

is very bad or is not readily stopped, a physician should be called.

Another way to stop nosebleed

Stuff a little roll of cotton high up in each nostril, then firmly pinch the soft portion of the nose, pressing hard against the bone as high up as possible. Hold the head high. Nearly every nosebleed may be stopped by this method in ten or fifteen minutes. The pressure must be continued long enough to allow the blood to clot. The cotton should be left in place for two or three hours or over night. Otherwise the bleeding may return. If you know positively which side of the nose the blood comes from, it is not necessary to put cotton in the other side.

For frosted feet or chilblains

Dip the feet alternately in hot water and cold water. The cold water should be of ordinary temperature and the hot water should be as hot as can be borne (105 to 110 degrees F.). The feet should remain about a quarter to a third of a minute in the hot water and half as long in the cold water. Repeat the dipping ten or fifteen times. Do this every night and morning and in a few days the difficulty will disappear.

How to treat burns

Two sisters were standing near an open fire early one Christmas morning, taking the gifts from their stockings. Suddenly the dress of the younger one caught fire. Before even the girls were aware of it, the flames shot above the child's head.

"Lie down on the floor! Lie down quick, Nettie!" urged the older girl, who remembered that flames always rise upward, and who knew that if Nettie remained standing the flames would have a good chance to burn her seriously. While Nettie, who was terribly frightened, hesitated as to what to do, her sister threw her to the floor and, grabbing an Indian blanket from the couch, drew it close about Nettie's neck, afterward wrapping it tightly

around her, from head to foot. Then she lifted a corner of the floor rug and, rolling Nettie over and over in it, wound it snugly about her. She acted so promptly that before their parents reached the scene the fire had been smothered.

Nettie was unharmed, save for the singeing of her hair and a few slight burns. The brave little rescuer had really suffered the greater harm. In the excitement of the moment she had not thought of herself. When, however, the danger was past she realized that her hands had been burned in several places. As the skin was still whole, her mother wet pads of cotton in *picric acid* solution and bound them over the burned places to relieve the pain. If she had not had picric acid, she would have put a heaping teaspoonful of baking soda in a pint of tepid water for the little girl to keep her hands in. It would have been just as well to put soft cloths, doubled several thicknesses and wet in the soda water, on the burns. Tepid water alone, without any soda, will ease the smarting from a burn; but contact with the air always increases the pain.

If the skin had been destroyed, something that would have covered the entire surface and protected it from the air would have been needed. White vaseline is good for this purpose. A specially prepared paraffin obtainable from a druggist is better.

Fourth of July accidents

The Fourth of July is a day of good times and festivities. Yet it is a sad fact that more boys and girls are killed or maimed for life on that day than on any other during the entire year. In 1910, over five thousand individuals in the United States, many of them children, met with Fourth of July accidents resulting in a loss of life or injury to some part of their bodies. Just think of thousands of persons, more people than are wounded in some battles, each losing an eye, a thumb, a hand, an arm, a leg, or even life, on a day of celebration! In 1920 there were not more than one third as

many accidents as in 1910, because in most cities and towns the authorities have already forbidden the sale of giant crackers, toy cannons, and similar articles. Is this wise?

EVERY YEAR, MANY PERSONS ARE SERIOUSLY INJURED IN FOURTH OF JULY ACCIDENTS.

The dreadful disease called *tetanus* or *lockjaw* often follows Fourth of July injuries. Bacteria very commonly found in dirt are the cause of it. These may be carried into the wounds on bits of soiled clothing or other dirty material. This is likely to happen to jagged wounds on the hands or feet made by gunpowder. Now you can see why it is so necessary to cleanse a wound with special care. Other bacteria, too, beside the tetanus germ are likely to make their way into the blood through any broken place in the skin.

Lockjaw may also result from the breaking of the skin by stepping on a rusty nail or a dirty piece of broken glass. Fortunately, there has been discovered an *antitoxin* which, if given in time, may prevent this dreadful disease. It is safer to run no risks. When a wound is made by anything likely to convey the germ, a physician should be called to give antitoxin.

Every person knows how annoying a splinter or a thorn in the flesh is. Even a very little thing like this may cause considerable suffering if not promptly removed. The best way to remove a splinter is to pull it out with a pair of small pliers or tweezers. To dig it out with a pin or needle may tear the flesh. When there is nothing else at hand a needle may be used; but first hold it for a few seconds in the flame of a candle or a burning match to make it *sterile* (free from germs).

To remove a splinter

THE BEST WAY TO REMOVE A SPLINTER IS TO PULL IT OUT WITH A PAIR OF SMALL PLIERS OR TWEEZERS.

Even so small a wound needs to be cleansed in soap and water, then painted with tincture of iodine, and protected by a dressing from dirt and germs. We cannot be too particular with wounds upon the hands, and the feet, too, if one goes barefoot. These members come so often in contact with dirt and dirty things that when the skin is broken dangerous germs may get in.

Let us look now at another kind of accident. Several girls were recently chatting together in an overwarm room, when one of them fainted. Her frightened companions laid her upon a lounge, piling the pillows high under her head.

The treatment of a person who has fainted

"Oh, not that way!" cried one of the group, coming forward;

WHEN ONE HAS FAINTED, THE BLOOD HAS LEFT THE BRAIN, SO THE HEAD SHOULD BE PLACED LOWER THAN THE FEET.

"open the windows and give her air. Take out the pillows and help me to put some books under the foot of the lounge to make that end higher. Wet her face and neck with cold water. We must loosen her clothing, too," she added, as she began to unfasten her collar and waist. With this treatment, the color came back to the girl's face very shortly, and in a few minutes she had quite recovered.

"Why did you lower her head?" questioned some one.

"Because," replied the girl, "when a person faints, a large share of the blood has left the brain, and we want to do everything we can to bring it back again. Unfastening the clothing helps; and besides, it makes it easier for the person to breathe. When a person feels very faint the best thing for him to do is to sit in a chair and bend forward, bringing the head as low as possible. If it had been sunstroke, though, the right thing

to have done would have been to raise the head as high as possible, because in that case there is too much blood in the head."

"But how can one tell them apart?" was asked.

"Why, a person who has fainted is very pale, while a person with too much blood in the head has a flushed face," was the response.

For sunstroke, which is a very serious thing, a doctor should be called at once. While waiting for him, one can help by putting an ice bag on the victim's head, and bathing the face and chest with cold water.

When something lodges in the throat, eye, or nose

Here is another accident: A creeping baby swallowed a button which lodged in his throat. His mother, frightened by his choking, was unable to do anything for his relief. A guest quickly suspended the child by his feet, gave him a vigorous shake, with a sharp slap on the back, and the button flew out of his mouth.

REMOVING A CINDER FROM THE EYE

When anything pointed, jagged, or sharp, as a pin or a fishbone, is swallowed, the wise thing for a person to do is to eat a full bowl of corn meal mush *without milk* or a large quantity of mashed potato or soft bread in order to distend the intestine so as to make it possible for the object to move along the food tube.

If you should ever have the misfortune to get sand or dirt in your eye, remember not to rub it. Often the tears will wash out the dirt. Sometimes closing the eyes tightly and blowing the nose hard is sufficient. Drawing the upper lid away from the eye and gently stroking it in a downward direction is another good thing to do. If none of these methods succeeds, some one who understands how to do it should be called upon to remove the sand or cinder with the twisted corner of a handkerchief. Particles which have become stuck in the eye must, of course, be removed by a physician.

Small objects in a nostril, if not crowded up too far, may generally be removed by putting a finger upon the other nostril so as to close it, keeping the mouth shut meanwhile, and blowing the nose hard.

A bruise caused by a blow received upon any of the soft parts of the body, a stubbed toe, or a jammed finger are best relieved by a hot *fomentation* applied to the injured part. A *fomentation* consists in applying cloths wrung out of very hot water. Flannel cloths are best for this purpose. Pieces of an old flannel undergarment, two or three woolen stockings, or a piece of an old shawl may be used if soft flannel cloth or a woolen blanket are not convenient.

Bruises

Have the water near the boiling point. The cloth should be somewhat larger than the part to be treated. Fold the cloth so as to get the right width, but about twice the needed length. Grasp it by the ends, and dip the center in the hot water. By twisting the ends, the hot water can be squeezed out without touching it with the hands. A dry flannel cloth should be laid next to the skin, the hot wet cloth should be laid above that, and the whole should be covered with another dry flannel cloth. As soon as the wet cloth ceases to feel hot, it must be reheated in the hot water. Repeat this for fifteen minutes. Then

remove the hot cloths and, for the finish, apply one wet in very cold water. Carefully dry the parts afterward. For toothache this treatment will generally afford relief.

For bites and stings from common insects bathe the parts in salt and water or a strong solution of soda. When a sting has been left in the wound it should be withdrawn. Why? Bites and stings

One August day, not long ago, several boys who belonged to a Boy Scout company were picking berries in a huckleberry patch, when one of the number who was barefoot was bitten by a rattlesnake. Telling some one else to run for aid, the oldest lad in the group picked the boy up in his arms, carried him a short distance to a safe spot on level ground, and, pulling off his necktie, bound it tightly about the wounded leg between the bite and the heart. Breaking a short twig from a tree, he fixed a tourniquet and twisted it until the necktie was tight enough to shut off the circulation. With his pocket knife, he made two quick cuts, crossing each other in the flesh over the wound, and going in just a little deeper than the snake's fangs had gone. Then squeezing the wound to make the blood flow, he put his lips to it, and sucked it vigorously, spitting out the poisoned blood as it came. Why did he do this unusual thing?

You will be interested to learn that it saved the boy who was bitten. Of course, no one with sores on his lips could with safety do such a thing. Why? It would do no good, either, to suck the wound made by the fangs of the snake without making the wound bigger, because the fangs do not leave an opening in the flesh any larger than would a fine-pointed needle, which is altogether too small for the poison to be drawn out.

It was most fortunate for the boy that he kept perfectly still after he was bitten. If he had become excited and run home, as boys are likely to do at such times, his blood would have flowed

more rapidly, and then it would have more quickly carried the poison throughout his whole body. I suppose you know that the venom of a snake is very poisonous. To keep it from circulating in the body is the one thing to do when a person is bitten.

It is well to bathe the wound thoroughly with water. Some *permanganate of potash* dissolved in the water until it becomes a deep wine color is still better for bathing the wound. The very best way is to rub the crystals of permanganate of potash right into the wound as quickly as possible, and to keep it covered with a pad wet with a solution made of some of the crystals dissolved in water.

It used to be believed that a dose of whisky should be given to cure a snake bite. A few years ago, a physician (Dr. Ellis Allen) proved by a series of experiments, in which small animals were given the snake poison of the copperhead moccasin, that whisky has no value whatever as a cure. Rats given the whisky died earlier than did rats of the same size that had no whisky, although all were given the same amount of poison.

It is well-nigh impossible for snakes to drive their fangs through rubber, so that it is a good plan to wear rubber boots when one must walk or work in places which snakes frequent. In addition, one should always carry at such times a dram or two of permanganate of potash crystals ready for use.

To revive a drowning person

In the chapter on "Health Habits in Breathing" (Chapter XIV) instructions were given for the treatment of drowning persons. You should read again pages 111, 112, and 113, so that you will be ready to help a person who may have had an accident in the water.

For a small flesh wound

Wash the injured parts with hot water, using soap if the parts are very dirty or soiled with oil or grease. Paint with a tincture of iodine and apply a light, clean bandage. Make firm pressure to stop bleeding if necessary. If the parts are badly bruised and there is much pain, soak

in hot water for ten or fifteen minutes or until the pain is relieved. Repeat if necessary. Paint again with iodine after soaking.

If you wrench or sprain your ankle so that walking is painful, it should be allowed to rest for a few days. Soak the foot in hot water for fifteen minutes three times a day. The water should be as hot as can be borne (105 to 110 degrees F.). After two or three days the ankle should be gently rubbed with oil twice a day. Use the ankle carefully for a time.

For a sprain

Heat applied in some form is a wonderful remedy for pain. Heat kills pain. It is much better to relieve pain by means of heat than by the use of medicines, and whenever possible this simple method should be used. Parts like the hands and feet, when painful, may be immersed in hot water. The water must be more than warm; it must be nearly as hot as you can bear, — 105 to 110 degrees. The heat may be increased after a minute or two by the addition of more hot water. When other parts of the body are the seat of pain, fomentations may be applied as described on page 246. Usually three or four applications are sufficient to relieve ordinary pains. The parts should be well covered to keep them warm after the hot application has been made. If chilling occurs, the pain will quickly return. A rubber bag filled with very hot water is sometimes more convenient, though less efficient, than the fomentation. Heat may also be applied by means of the electric light (the photophore), by hot sand bags, heated bricks, or other heated objects.

For pain in any part of the body

REMEMBER: To know what to do in case of an accident is very important; but it is even more important to prevent accidents by using knives and all other sharp instruments, firearms, and explosives in a cautious manner. To pour kerosene on a fire, to fill a kerosene lamp or a gasoline stove while either

is burning, to take a lamp or candle or any sort of flame into a room where gasoline is being used for cleaning or where a gas pipe is leaking, is to invite accidents. But one ought occasionally, in order to gain practice, to imagine that an accident has occurred, and then see how quickly and effectively he can treat it. In this way he may be ready, when a real accident does occur, to treat it properly.

Health Problems

1. What accidents are likely to happen to people on the street any day?
2. In accidents which result in bleeding, should the treatment be applied *always* between the cut and the heart? Why?
3. In most of the wounds you observe, does the blood flow from the artery or from a vein? How can you tell?
4. Have you ever had an accident to the skin which left a *festering* sore? Why should this have happened? Could it have been prevented?
5. In wiping off blood from a cut, is it right first to moisten the cloth in the mouth?

Review Questions

1. What is a *tourniquet?* How is it used?
2. What is the color of blood that flows from an artery? From a vein?
3. Where should pressure be applied in order to stop bleeding when an artery is injured?
4. Where should the pressure be applied when a vein is injured?
5. What is a good way to stop bleeding when a cut is not very severe?
6. How should a wound be treated when it is made with broken glass? With a nail?
7. What is a good way to stop nosebleed?
8. What should be done when the skin is burned?
9. What accidents are likely to happen from the use of giant crackers, toy cannons, and similar articles?
10. What should be done to a wound when the bleeding stops?
11. How should one disinfect his hands if he is going to touch a wound? Why is this necessary?

12. What is the disease called *lockjaw?* How is it caused?

13. What has been discovered that helps to cure lockjaw?

14. How should a splinter or thorn be removed from the flesh? Would it be well to dig it out with the point of a needle?

15. Why must care be taken with cuts or bruises on the feet?

16. What should be done when a person faints? How can you tell when a person has fainted?

17. What should be done when one suffers from sunstroke?

18. How should one get sand or dust out of the eye?

19. How should small objects be removed from the nostrils?

20. What is a *fomentation?*

21. How can fomentation be used to help a person who has had an accident?

CHAPTER XXVI

Health Exercises

Unless one is working or playing out-of-doors much of the time, he ought to spend a few minutes every day — the same time every day — in health exercises. He will be well repaid in health and good feeling for all the time he spends in this way. The following are good health exercises, which you will enjoy. See how well you can do them.

(1) (2) (3)

Body-warming exercise

Body-warming exercise

Stand erect, head high and chest up (1); jump to stride position and at the same time fling the arms upward and clap the hands above the head (2); bring the feet together with a jump and fling the hands down-

ward and backward with a clap behind (3). Repeat 20–30 times. This exercise improves the circulation.

From the standing posture (1), holding the chest well forward and the head high, fling the arms forward, crossing the arms in front (2); fling the arms vigorously outward (3); carry them backward till the

Hand-warming exercise

(1) (2) (3) (4)

HAND-WARMING EXERCISE

hands meet with a strong clap behind (4); taking care to keep the chest well forward and the head erect during the entire exercise. Repeat 20–30 times, breathing deeply.

Stand erect, head high, chest up (1); jump to stride position, at the same time turning slightly toward the right and throwing both hands over the right shoulder (2); bend forward until the finger tips touch the floor (3); raise the trunk, jump back to original position (1). This exercise is fine for the liver, kidneys, intestines, and other organs

Exercise for internal organs

(1) (2) (3)

EXERCISE FOR INTERNAL ORGANS

(1) (2) (3)

POSTURE EXERCISE

(1) (2) (3)

LEG AND TRUNK EXERCISE

(1) (2) (3)

EXERCISE FOR THE TRUNK MUSCLES

Posture exercise

Standing erect, arms at sides, bring hands to shoulders, elbows to sides (1); bend forward, holding the trunk rigid and bending only at the hips (2); extend the hands above the head with vigor (3). Repeat 10–15 times. This exercise strengthens the muscles of the back, expands the chest, and develops a good standing poise.

Leg and trunk exercise

Stand erect, chest up and head high (1); squat, resting hands upon the floor (2); jump back, throwing the body into the position shown at (3); extend the legs backward, supporting the body with the hands and toes. Return to standing position (1). Repeat 10–20 times.

Exercise for the trunk muscles

Stand erect, chest up and head high, arms at the sides (1); stretch arms upward with vigor, reaching up as far as possible (2); bend backward, keeping the arms in line with the trunk (3). Repeat 5–10 times. This exercise strengthens the muscles of the abdomen and back.

(1) (2) (3)

BREATHING EXERCISE — SWIMMING

Standing erect, head high and chest up, bring the hands together in front (1); extend hands forward vigorously, with palms down (2); move arms sidewise, palms directed backward, breathing in (3). Breathe while moving the arms sidewise, and breathe out while thrusting the arms forward. Repeat 8–10 times.

Breathing exercise — swimming

(1) (2) (3)

BALANCE EXERCISE

Standing, place hands on shoulders, elbows at sides (1); bend forward, carrying one leg backward in line with the trunk (2); continue bending the trunk forward and raising the leg backward until the leg and trunk are horizontal, slightly bending the opposite leg (3). This is a capital exercise for the muscles of the legs and trunk. Repeat 5–10 times.

Balance exercise

CHAPTER XXVII

Safety First

Dangers often unsuspected are constantly lurking about, ready to involve us in trouble, or to cause serious injury, if we are careless. The next time you see a squirrel or a wild bird notice that the little creature is always on the lookout. It is never off its guard a minute. If the squirrel is nibbling a nut, it takes a little bite, then turns its head this way and that while it chews. If a bird puts its head to the ground it is up again in two seconds, looking out for danger. The squirrel and the bird — every wild creature, in fact, — notices every sound, every rustle in the leaves, every snapping twig. Not a circumstance of any sort escapes its attention.

Avoid danger

We have become so accustomed in infancy and childhood to being cared for and protected by our parents and other older persons that we often neglect to form those habits of watchfulness that are necessary for our protection amid the multiplying dangers with which we are surrounded, especially in the crowded streets of a great city.

Safety first is an excellent motto. Take no unnecessary risks. If you are in a hurry or feel an impulse to dash across the street although you see an automobile coming only a few rods away, don't do it. Wait. In ten seconds the automobile will have gone by and you can pass safely. You might have crossed safely a few feet ahead of the auto-

Safety first

mobile, but suppose you had stumbled or become bewildered or a drunken or reckless driver had increased his speed. You might have lost a leg or an eye or your life.

EVERY DAY, THROUGH CARELESSNESS, MANY PERSONS ARE KILLED OR MAIMED BY AUTOMOBILES.

Some boys and girls like to do risky things. "Dare-devils," we call them. They are foolish; do not imitate them; they may lose their lives in some rash adventure. Take no risk unless necessary. In crowded cities do not attempt to cross a street anywhere except at the regular crossings, and then watch the policeman's signal and cross when other people do. The hundreds of automobile accidents which are happening every day are chiefly due to neglect to follow well-known traffic rules.

Don't be a "dare-devil"

Always "look before you leap," especially when alighting from a street car. There may be an automobile or another

street car coming toward you. There is always somebody about who is likely to violate traffic rules and thus endanger your life. Never get off or on a moving street car.

Watch your step

"*Watch your step*" is a capital rule to follow, not only when getting on and off street cars and busses, but at all times. Did you ever see a dog stumble? A dog always watches his step, and so does a horse, when he has a chance. If a horse stumbles it is likely to be because his eyes are covered with blinds and his head held so uncomfortably high with a checkrein that he cannot see the road plainly. We are so accustomed to smooth walks and even pavements that we are likely to forget to look out for pitfalls and stumbling-blocks. But we are likely to encounter them; hence "Watch your step" is excellent advice.

EVERY DAY MANY PEOPLE ARE INJURED BY GETTING ON OR OFF MOVING STREET CARS.

A few *dont's* to be observed

Don't allow a foolish boy or girl to "dare" you into doing perilous things.

Don't go into deep water until you learn to swim. It is not necessary to run any risk of drowning before you have learned how to keep yourself afloat. Don't swim until at least an hour after eating.

Don't keep matches about unless they are safety matches. All other kinds are dangerous.

Don't "fool" with firearms. Never keep loaded firearms. The "didn't-know-it-was-loaded" excuse won't restore the finger you have shot off or bring to life a loved playmate whom you have accidentally killed.

MANY PEOPLE LOSE THEIR LIVES THROUGH CARELESSNESS WITH FIREARMS.

Don't taste the contents of an unlabeled bottle to find out what it is. You have never heard of a monkey's dying of accidental poisoning. The monkey carefully investigates everything before he swallows it. If there is anything dangerous about it, he finds it out before it is too late. We can learn many useful lessons from these very intelligent animals.

If you don't know the water is pure, do not drink it until it has been boiled. That will make it safe.

If you don't know the milk is clean and free from typhoid and other dangerous germs, take it boiled instead of raw. This will make it safe.

Thoroughly wash fruit before eating it; or if this cannot be done, in removing the outer peelings take care to avoid soiling the clean pulp beneath.

Don't lose your head. If danger threatens, keep cool, ready to act with promptness and good judgment. In doing this you need not become a coward, afraid to make any move lest some

harm should come to you. One who trains himself to careful watchfulness will be safe under circumstances in which a careless person would be running great risk.

GLOSSARY

KEY TO PRONUNCIATION

ā, as in **āle**; **a̱**, as in **sen′a̱te**; **â**, as in **câre**; **ă**, as in **ăm**; **ä**, as in **ärm**; **ȧ**, as in **ȧsk**; ***a***, as in ***fi′nal***; **ē**, as in **ēve**; **e̱**, as in **e̱-vent′**; **ĕ**, as in **ĕnd**; **ẽ**, as in **fẽrn**; ***e***, as in ***re′cent***; **ī**, as in **īce**; **i̱**, as in **i̱d-e′a**; **ĭ**, as in **ĭll**; **ō**, as in **ōld**; **o̱**, as in **o̱-bey′**; **ô**, as in **ôrb**; **ŏ**, as in **ŏdd**; **ū**, as in **ūse**; **u̱**, as in **u̱-nite′**; **ŭ**, as in **ŭp**; **û**, as in **ûrn**; **ў**, as in **pit′ў**; **o͞o**, as in **fo͞od**; **o͝o**, as in **fo͝ot**; **ou**, as in **out**; **oi**, as in **oil**.

A

abdomen (ăb-dō′mĕn). The middle part of the body, between the thorax and the pelvis, — the cavity which contains the stomach, bowels, and other organs.

accident (ăk′sĭ-dent). An unexpected event of an unfortunate nature.

adhesive (ăd-hē′sĭv). Sticky, clinging.

adulteration (ȧ-dŭl′tẽr-ā′shŭn). Making a food, drink, etc., impure by putting a foreign substance into it.

alcohol (ăl′kŏ-hŏl). The intoxicating element of fermented or distilled liquors.

alkaloid (ăl′kȧ-loid). Bitter substances found in nicotine, quinine, morphine, etc., that affect the nervous system strongly.

Anopheles (ăn-ŏf′ĕ-lez). The name given to the mosquito that carries malaria germs.

antitoxin (ăn′tĭ-tŏks′ĭn). A substance that destroys the poisonous effects of germ diseases.

antivenene (ăn′tĭ-vē′nĭn). An antitoxin or remedy for snake poison.

apparatus (ăp′pa-rā′tŭs). A collection or set of implements or organs for a given duty, as the vocal apparatus for making and regulating the voice.

aqueduct (ăk′we̱-dukt). A channel dug through the earth for carrying water.

arsenic (är′sẽ-nĭk). A poisonous substance which in its natural state resembles metal but is not a metal.

artery (är′tẽr-ȳ). One of the vessels or tubes which carry either venous or arterial blood from the heart. They have thicker and more muscular walls than veins and are connected with them by capillaries.

artesian well (är-tē′zhan). A well made by boring into the earth till the drill reaches water, which then flows of its own accord like a fountain.

artificial (är′tĭ-fĭsh′al). Not natural; made by human skill and labor.

asbestos (ăs-bĕs′tŏs). A substance that will not burn, and that is used to protect things from fire.

atom (ăt′ŭm). The smallest particle of matter.

B

backbone (băk-bōn′). The column of bones in the back which sustains and gives firmness to the body, sometimes called the spine, or spinal column.

bacteria (băk-tē′rĭ-à) (pl. of bacterium). Living bodies too small to be seen by the naked eye. Certain kinds are harmful to the body; other kinds are helpful.

bellows (bĕl′ōz). An instrument which by the opening and closing of its sides draws in the air through a valve and expels it through a tube, and is used for blowing fires, ventilating mines, or filling pipes.

beverage (bĕv′ẽr-ăj). Anything used as a drink, usually applied to drink artificially prepared, and of agreeable flavor, as lemonade.

blood vessel (blŭd vĕs′sĕl). Any vessel or canal in which blood circulates, as an artery or vein.

boracic acid (bō-răs′ĭk). An acid made from borax, and used to destroy germs.

brisk (brĭsk). Lively; spirited; quick.

bubonic plague (bū-bŏn′ĭk plāg). A deadly contagious fever that causes swelling of the glands.

C

canal (kà-năl′). A tube or duct for conveying food or liquid, as the alimentary canal.

capillary (kăp′ĭl-lă-rȳ or kà-pĭl′là-rȳ). A tiny thin-walled tube that connects a vein and an artery.

carbolic acid (kär-bŏl′ĭk). A poisonous acid derived from coal tar and other sources. It is a strong germ destroyer.

carbon dioxide (kär′bŏn dī-ŏks′īd or -id). A gas formed in the lungs when one breathes.

cartilage (kär′tĭ-lāj). Elastic tissue or gristle connecting muscles and bones.

catarrh (kȧ-tär′). "Cold in the head," or inflammation of the mucous membrane in which there is an increase in the amount of mucus secreted; especially applied to the nose.

cavity (kăv′ĭ-tў). A hollow place, as the abdominal cavity.

cell (sĕl). One of the minute parts of which most of the various tissues and organs of animals and plants are composed.

certified (sēr-tĭ-fīd). Guaranteed to be pure, applied mainly to milk.

cesspool (sĕs′pōōl′). A sort of cistern for filth; made usually at the end of a drain.

chamois (shăm′mў). A soft skin or leather made from the skin of an animal, the chamois.

chest (chĕst). The part of the body inclosed by the ribs and breast bone; also called the thorax.

chicken pox (pŏks). A contagious disease attended by itching and peeling skin in the last stages. Unless care is taken to prevent it, the patient will be left with small scars or pits on his body.

chlorine (klō′rĭn). Chlorine is a greenish yellow gas, evil smelling and poisonous. A strong germ destroyer.

cholera (kŏl′ēr-ȧ). A dangerous disease, very contagious, originating in filth.

cholera infantum (kŏl′ēr-ȧ ĭn-făn′tŭm). A dangerous summer disease of infants caused by hot weather, bad air, or poor milk.

circulate (sēr′kū-lāt). To move in a circle.

colander (kŭl′*an*-dēr). A dish with little holes for straining liquids, mashing vegetables, etc.

combustion (kŏm-bŭs′chŭn). Burning up, as when wood or coal burns to ashes in a grate.

competitive (kŏm-pĕt′ĭ-tĭv). An adjective applied to a contest between two or more persons, as in a race or a spelling match.

congested (kŏn-jĕst′ĕd). Condition caused by the blood's gathering in an unusual quantity in any part of the body.

contaminated (kŏn-tăm′ĭ-nā′tĕd). Tainted, polluted, spoiled.

contract (kŏn-trăkt′). To draw together; to shorten, as the muscles of the arm contract when the arm is bent.

cramp (krămp). To squeeze, to prevent an organ from having free action.

Culex (kū′lĕks). The name given to the kind of mosquito that does not carry germs.

culture plate (kŭl′tŭr). The plate on which is placed a fluid in which germs are made to develop.

D

decay (dē-kā′). To waste away; to rot; to perish.

decompose (dē′kŏm-pōz′). To rot; to decay.

defile (dē-fīl′). To make foul or impure.

deformity (dē-fôrm′ĭ-tȳ). Any unnatural shape or form; distortion; irregularity of shape or features; ugliness.

degenerate (dē-jĕn′ẽr-āt). Having lost in strength or power of body or mind; degraded, base, low.

dermis (dĕr′mĭs). The deep sensitive layer of the skin beneath the scarfskin, or epidermis.

diaphragm (dī′ȧ-frăm). The muscular partition separating the cavity of the chest from that of the abdomen.

digest (dĭ-jĕst′). To separate the food in its passage through the alimentary canal into its nutritive and non-nutritive elements.

digestion (dī-jĕs′chŭn). The process of preparing the food to nourish the blood.

diphtheria (dĭf-thē′rĭ-ȧ). A very dangerous contagious disease in which the air passages, especially the throat, become coated with a false membrane.

discus (dĭs′kŭs). A circular plate of some heavy material intended to be pitched or hurled as a test of strength and skill.

disease (dĭz-ēz′). Any change in the state of the body or of an organ, causing pain and weakness; illness; sickness.

disinfect (dĭs-ĭn-fĕkt′). To free from disease germs; to purify.

disk (dĭsk). A flat, round plate.

distill (dĭs-tĭl′). To vaporize; to condense; to purify water, especially by taking off the pure water as steam and leaving the impurities behind.

distillation (dĭs′tĭl-lā′shŭn). The separation of the parts that have the

power of evaporating from the more fixed parts of a substance; vaporization; condensation.

duct (dŭkt). A tube or canal through which any fluid is carried.

dysentery (dĭs'ĕn-tĕr-ȳ). A serious disease of the bowels, occurring usually in summer.

E

efficiency (ĕf-fĭsh'*e*n-sȳ). The power of doing the greatest amount of work with the least waste in a given time.

enamel (ĕn-ăm'ĕl). The very hard tissue entering into the composition of the teeth.

environment (ĕn-vī'rŭn-m*e*nt). Surrounding conditions, influences, or forces, by which living forms are influenced and modified in their growth and development.

epidemic (ĕp'ĭ-dĕm'ĭk). A disease which affects many people at the same time, and which spreads widely.

epidermis (ĕp'ĭ-dĕr'mĭs). The outer layer of the skin; cuticle; scarfskin.

epileptic (ĕp'ĭ-lĕp'tĭk). A person who is afflicted with the disease that causes him to fall suddenly unconscious and to have convulsions of the muscles.

erect (ĕ-rĕkt'). Upright; not leaning or bent.

evaporate (ĕ-văp'o-rāt). To change from liquid into vapor, as when water evaporates in the sun.

F

fermentation (fĕr'mĕn-tā'shŭn). The change that takes place in fruit juice and the like when alcohol is formed.

filth (fĭlth). Foul matter; anything that soils or defiles; dirt.

filtration (fĭl-trā'shŭn). The process of separating a liquid from the undissolved particles floating in it.

flabby (flăb'bȳ). Hanging loose by its own weight; not firm or strong.

fluid (flū'ĭd). A body whose particles move easily among themselves and do not tend to remain in any one form. Not solid, as water, milk, etc.

fomentation (fō'men-tā'shŭn). The application of warm, soft, medicinal substances for the purpose of relieving pain.

formaldehyde (fôr-măl'dĕ-hīd). A disinfectant, used to kill the germ especially of fevers.

foundation (foun-dā′shŭn). That upon which a thing is supported or built, as the foundation of a house.

framework (frām′wûrk). The skeleton upon which the body is hung.

fume (fūm). Smoke; vapor.

G

garbage (gär′bāj). Refuse from the kitchen.

gelatin (jĕl′ā-tĭn). Animal jelly obtained from animal tissues by prolonged boiling. This substance dissolves in hot water and forms a jelly on cooling.

germ (jĕrm). Every living thing originates in a germ, the earliest form under which an organism appears.

germicide (jĕr′-mĭ-sīd). Destructive to germs.

glucose (glū′kōs′). A kind of sugar found in ripe grapes, etc.

grippe (grĭp). Influenza or severe "cold in the head."

gymnastics (jĭm-năs′tĭks). Exercises taken regularly.

H

hookworm (hŏŏk′wûrm). A tiny animal that gets into the blood through the skin and makes its way to the bowels and sucks the blood of its victim.

hydrant (hī′drant). A device with a valve and spout at which water may be drawn from the mains of waterworks.

hysterical (hĭs-tĕr′ĭ-kăl). An intensely nervous state in which a person loses control of his nerves, and laughs and cries in an uncontrolled way.

I

impurity (ĭm-pū′rĭ-tў). Foulness; adulteration; a state of being unfit to use.

infantile paralysis (ĭn′fan-tīl pā-răl′ĭ-sĭs). A disease in an infant which results in loss of power of locomotion.

influenza (ĭn′flŭ-ĕn′zā). A disease characterized by acute nasal catarrh, or by inflammation of the throat or the bronchi, and usually accompanied by fever.

inorganic (ĭn′ôr-găn′ĭk). Without life; inanimate, as a stone, etc.

intestines (ĭn-tĕs′tĭnz). The bowels.

iodine (ī′ō-dĭn or dēn). A drug, often used as a germ destroyer.

J

joint (joint). The place at which the bones unite or connect.

L

larva (lär′vȧ). Any young insect from the time it hatches from the egg until it becomes a pupa or chrysalis.

ligament (lĭg′ȧ-ment). A tough band which unites bones or forms joints.

loathsome (lōth′sŭm). Exciting disgust, especially because of filthy nature; sickening.

M

maggot (măg′gŭt). The footless young or larva of any fly.

malady (măl′ȧ-dy). Any disease of the human body; especially a lingering or deep-seated disease.

malaria (mȧ-lā′rĭ-ȧ). A fever caused by the bite of a certain mosquito.

measles (mē′z′lz). A contagious disease marked by the appearance on the third day of a rash on the skin.

membrane (mĕm′brān). A thin layer or fold of tissue serving to cover or line some part or organ, and often secreting or absorbing certain fluids.

menace (mĕn′ȧs). A threat or forewarning of evil or catastrophe.

microbe (mī′krōb). An animal body so small that it cannot be seen by the eye unaided.

microörganism (mī′krō-ôr′*g*an-iz′m). A very small living thing which can be seen only by the aid of a microscope.

microscope (mī′krō-skōp). An instrument for making an enlarged image of an object which is too small to be seen by the naked eye.

mucous membrane (mū′kŭs mĕm′brān). The membrane lining passages and cavities which communicate with the exterior.

mumps (mŭmps). A contagious disease which produces a swelling of glands in the neck.

N

nicotine (nĭk′ō-tĭn). A substance which is found in tobacco. It is poisonous.

nostrils (nŏs′trĭls). The openings of the nose through which the air we breathe passes in and out of the lungs.

O

observant (ŏb-zẽrv'ant). Watchful; on the alert to notice objects and happenings.

opium (ō'pĭ-ŭm). Poppy juice, used as a drug.

organic (ôr-găn'ĭk). Living, as a plant or animal.

oxygen (ŏks'ĭ-jĕn). One of the elements of which air is composed, and which is necessary for life.

P

parasite (păr'ȧ-sīt). A plant or animal obtaining nourishment immediately from other plants or animals to which it attaches itself.

Paris green (păr'ĭs grēn). A poisonous green powder used chiefly to kill insects.

particle (pär'tĭ-k'l). A minute part of matter; an atom.

pasteurization (păs-tẽr'ĭ-zā'shŭn). A process devised by Pasteur for killing germs and so preventing or checking fermentation, especially in milk.

peevish (pē'vĭsh). Habitually fault-finding; easily vexed or fretted; hard to please.

permanent (pẽr'mȧ-nẽnt). Durable; fixed; lasting, not changeable.

permanent teeth (pẽr'mȧ-nẽnt tēth). The teeth which remain after the temporary teeth have decayed.

permanganate (pẽr-măn'gȧ-nāt). A salt derived from manganese.

perspiration (pẽr'spĭ-rā'shŭn). Sweat.

perspiratory glands (pẽr-spīr'ȧ-tô-ry glăndz). The glands through which the perspiration comes to the surface of the skin.

petroleum (pẽ-trō'lẽ-ŭm). A mineral oil, or natural oil.

photometer (fô-tŏm'ẽ-tẽr). An instrument for measuring the amount of light in a place.

picric acid (pĭ'krĭk). An intensely bitter acid.

plague (plāg). A pestilence; a disease which kills many people at one time.

pneumonia (nû-mō'nĭ-ȧ). A disease of the lungs.

pollute (pŏl-lūt'). To make foul; to taint; to spoil.

pores (pōrz). Minute openings or passageways, especially in the skin.

posture (pŏs'tûr). The position of the body.

precaution (prē-kạ'shŭn). Looking ahead to ward off evil or to secure good.

premises (prĕm'ĭ-sez). A piece of real estate; a building and its adjoining grounds.

preservative (pre-zẽrv'ạ-tĭv). That which has the power or quality to keep a thing from decaying.

prohibition (prō'hĭ-bĭsh'ŭn). The act of forbidding by authority.

ptomaine (tō'mā̆-ĭn). Poison which has its origin in dead matter.

pulmotor (pul'mō'tẽr). An instrument by means of which the lungs of a drowning person may be filled and emptied with regularity.

pulse (pŭls). The beating of the heart or blood vessels, usually felt at the wrist.

pupa (pū'pạ). Any insect in that stage of its change just before the adult stage.

R

recreation (rĕk'rē-ā'shŭn). Refreshment of the strength and spirits after toil, by means of rest or pleasure.

refuse (rĕf'ū̆s). Waste. Matter that is useless or worthless.

relax (rē-lăks'). To make lax or loose; as to let the muscles become slack.

reservoir (rĕz'ẽr-vwôr). A place where anything is kept in store; as the heart, where blood is kept in store.

respiration (rĕs'pĭ-rā'shŭn). Breathing.

S

sac (săk). A cavity or bag, usually containing fluid, and either closed or opening into another cavity or to the exterior.

salicylic acid (săl'ĭ-sĭl'ĭk). Used sometimes as a remedy in rheumatism.

saliva (sạ-lī'vạ). The fluid that is found in the mouth and that is needed to start the digestion of starchy foods.

sallow (săl'lŏ). Having a yellowish color; of a pale, sickly color, tinged with yellow.

sal soda (săl' sō'dạ). A substance used in making soap, glass, paper. Called also *washing soda* or *soda*.

sanitation (săn'ĭ-tā'shŭn). Making clean or pure so as to secure or preserve health.

sash (săsh). The framing in which the panes of glass are set in a window, including the narrow bars between the frames; used for the entire half of a window, as, *upper sash*, *lower sash*.

scarfskin (skärf′skĭn′). The outside layer of skin, or epidermis.

scarlet fever (skär′lĕt fē′vẽr). A contagious disease in which the patient has a red rash on his body that causes his skin to peel about the seventh day after the rash appears.

scavenger (skăv′ĕn-jẽr). A person whose business is to clean the streets; any animal which eats refuse or anything injurious to health.

secrete (sẽ-krēt′). To separate a fluid from the blood by the process of secretion; to hide, to conceal.

sediment (sĕd′ĭ-m*ẹ*nt). The matter which drops to the bottom from water or any other fluid.

shambling (shăm′blĭng). Awkward, irregular walking or running.

shellac (shĕl-lăk′). A substance produced mainly on the banyan tree, and sometimes used to coat candy, though its proper use is on furniture, etc.

shrivel (shrĭv′l). To draw, or be drawn, into wrinkles.

skeleton (skĕl′ẽ-tŭn). The firm or hardened framework on which the body is hung.

skull (skŭl). The skeleton of the head, including the brain case, or cranium, and the bones and cartilages of the face and mouth.

smallpox (sm*ạ*l′pŏks′). A contagious disease which causes the skin to peel and leaves deep pits, or scars.

spinal column (spī′n*a*l kŏl′ŭm). The backbone.

spine (spīn). The backbone, or spinal column.

sputum (spū′tŭm). Saliva; that which is expectorated; as when one has a cough.

stagnant (stăg′n*a*nt). Not flowing; motionless, usually slimy and bad.

Stegomyia (stĕg-ō-mī′yȧ). The name given to the kind of mosquito that carries the yellow fever germ.

sterile (stĕr′ĭl). Producing no crop; barren; unfruitful.

strychnine (strĭk′nĭn or nēn). A very poisonous substance, having a bitter taste, used in medicine as a nerve stimulant.

stunted (stŭnt′ĕd). Dwarfed, undersized.

suburban (sŭb-ûr′b*a*n). Of or pertaining to an outlying part of a city, or to a smaller place immediately adjoining a city.

suction (sŭk′shŭn). The act of sucking; the process of drawing in.

sulphite (sŭl′fīt). A salt of sulphurous acid.
sulphur (sŭl′fŭr). A substance often used for disinfection.
symptom (sĭmp′tŭm). Any affection which accompanies disease.

T

temporary teeth (tĕm′pō-rā̆-ry tēth). Teeth that grow first, and come out to make place for the permanent teeth.
tendon (tĕn′dŭn). A tough cord, bundle, or band uniting a muscle with some other part; sometimes called sinew.
tetanus (tĕt′a-nŭs). A painful and usually fatal disease, resulting generally from a wound. When the muscles of the lower jaw are affected it is called *lockjaw*.
thermometer (thē̆r-mŏm′ē̆-tē̆r). An instrument for measuring the amount of heat in the air or in the body or in water or milk, etc.
tonsillitis (tŏn′sĭl-ī′tĭs). A disease of the tonsils.
tourniquet (to͝or′nĭ-kĕt). A device for stopping a discharge of blood from the blood vessels.
toxin (tŏks′ĭn). A poisonous substance formed in the body, in meat, and elsewhere.
trunk (trŭn̲k). The part of the body not included in the head and limbs.
tuberculin (tū̆-bē̆r′kū̆-lĭn). A fluid containing the products formed by the growth of the tiny vegetable germ that is the cause of the disease called *tuberculosis*.
tuberculosis (tū̆-bē̆r′kū̆-lō′sĭs). A disease, especially of the lungs, sometimes called *consumption*.
typhoid fever (tī′foid fē′vē̆r). Of or pertaining to typhus, which is a contagious fever lasting from two to three weeks.

V

vein (vān). One of the vessels which carry blood, either venous or arterial, to the heart.
venom (vĕn′ŭm). Poison, particularly the poison which snakes secrete and communicate by stinging or biting.
ventilation (vĕn′tĭ-lā′shŭn). Replacing foul air by that which is pure, in any closed place, as a house or a church.
vigor (vĭg′ē̆r). Force; energy; active strength.
vigorous (vĭg′ē̆r-ŭs). Strong; full of active force; robust.
vital (vī′tal). Necessary to life.

W

welfare (wĕl′fâr). Prosperity; happiness; well-doing or well-being in any respect.

whooping cough (hōōp′ĭng kạf). A violent cough, returning frequently.

wigwam (wĭg′wŏm). An Indian tent.

windpipe (wĭnd′pīp). The passage for the breath from the larynx to the lungs; sometimes called the trachea.

wriggler (rĭg′glẽr). The young of the mosquito.

Y

yellow fever (yĕl′lō̆). A contagious fever of warm climates, produced by the infection from the bite of the Stegomyia mosquito.

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